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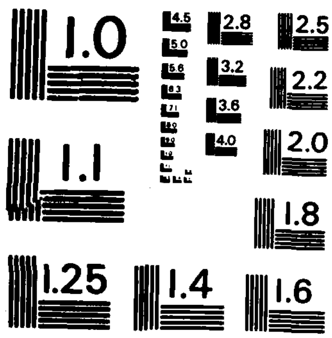

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AIR-ON DEMONSTRATION OF THE AEDC PWT TUNNEL 16T CAPTIVE TRAJECTORY SUPPORT SYSTEM

Louisa L. Arendt
Calspan Corporation

September 1985

Final Report for Period July 21, 1985 - July 26, 1985

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ARNOLD ENGINEERING DEVELOPMENT CENTER
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APPROVAL STATEMENT

This report has been reviewed and approved.

KEITH GIBBY, Capt, USAF
Aeronautical Systems Branch
Directorate of Aersp Flt Dyn Test
Deputy for Operations

Approved for publication:

FOR THE COMMANDER

ELTON R. THOMPSON
Dir, Aerospace Flt Dyn Test
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19. ABSTRACT (Continue on reverse if necessary and identify by block number)

AEDC

An air-on demonstration of the Captive Trajectory Support (CTS) system was conducted in the Propulsion Wind Tunnel (16T). ~~on July 21 through July 26, 1985.~~ The test objectives were: (1) to demonstrate the structural integrity of the CTS system; (2) to demonstrate the ability of the CTS system to satisfactorily obtain grid and trajectory generation data for a typical store model in free stream and relative to a simulated (flat plate) aircraft in a dynamic wind tunnel environment; (3) to obtain a Mach number calibration for the Tunnel 16T Cart 2 (Multipurpose Cart) with the CTS system installed. The 1/4-scale Maximum Volume Bomb (MVB) was used to represent a typical store. Data were obtained at free-stream Mach numbers from 0.6 to 1.6 and at various compressor ratios. keyword

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11. Title

Air-On Demonstration of the AEDC PWT Tunnel 16T Captive Trajectory Support System

18. Subject Terms (Concluded)

CTS structural integrity
1/4-scale Maximum Volume Bomb (MVB)
Cart 2

CONTENTS

ILLUSTRATIONS

TABLES

NOMENCLATURE

ALPHA	Aircraft model angle of attack with reference to the model centerline, deg (see Fig. 5)
ADM	Angular drive
BETA	Aircraft model angle of sideslip with reference to the model centerline, deg (see Fig. 5)
C	Centerline
CONFIG	CTS rig and aircraft configuration designation (see Table 5)
CPR	Compressor pressure ratio
HTM	Horizontal traverse mechanism which allows the CTS boom to move laterally
M_a	Average free-stream Mach number as determined by wall static pressure orifices over a defined region of the test section
MACH,M	Free-stream Mach number
M_c	Equivalent plenum chamber Mach number
M_l	Local free-stream Mach number
MVB	Designation for the 1/4-scale Maximum Volume Bomb store model
PT	Free-stream total pressure, psfa
$Re \times 10^{-6}$	Free-stream unit Reynolds number, per foot
RUN	Data set identification number
STA	Tunnel station, ft
t	Cumulative time for the trajectory, sec
TYP	Representative dimension
UCLM,UCLN, UCLL	Uncertainty in the measured store pitching-moment, yawing-moment, and rolling-moment coefficients
UCN,UCY,UCA	Uncertainty in the measured store normal-force, side-force, and axial-force coefficients

UTHETA,UPSI, UPHI	Uncertainty in the store angular position, deg, full scale.
Uz,Uy,Ux	Uncertainty in the store position, ft, full scale
VPB	Vertical Propulsion Balance
X,Y,Z	Positions of the store cg with respect to the store cg location when in the carriage position, ft
X_R, Y_R, Z_R	Positions of the CTS pitch center with respect to its midpoint of travel, ft (see Fig. 3)
WA	Wall angle; a positive value indicates walls are diverged, deg
η_R	CTS yaw angle, deg (see Fig. 3)
ν_R	CTS pitch angle, deg (see Fig. 3)
ω_R	CTS roll angle, deg (see Fig. 3)

1.0 INTRODUCTION

The work reported herein was conducted by the Arnold Engineering Development Center (AEDC), Air Force Systems Command (AFSC), under Program Element 65807F, Control Number 9501, at the request of AEDC/DO. The AEDC/DOFA project manager was Captain J. K. Gibby, and Mr. E. G. Allee was project engineer. The results were obtained by Calspan Corporation/AEDC Division, operating contractor for the Aerospace Flight Dynamics testing effort at the AEDC, AFSC, Arnold Air Force Station, Tennessee. The test was conducted in the Propulsion Wind Tunnel (16T) from July 21, 1985 through July 26, 1985 under AEDC Project Number CC83PG, PWT Test Number TF-694.

The test objectives were (1) to demonstrate the structural integrity of the Captive Trajectory Support (CTS) system throughout the operating envelope of Tunnel 16T; (2) to demonstrate the ability of the CTS system to satisfactorily obtain grid and trajectory generation data for a typical store model in free-stream and relative to a simulated (flat plate) aircraft in a dynamic wind tunnel environment; (3) to obtain a Mach number calibration for the Tunnel 16T Cart 2 (Multipurpose Cart) with the CTS system installed. The testing effort to meet objectives 1 and 2 is documented herein as the Verification Phase while the testing effort to meet objective 3 is documented as the Calibration Phase.

The effects of strain-gage balance digital filtering and the operation of the CTS system at various tunnel conditions were investigated during the Verification Phase while the effects of tunnel compressor ratio, test section wall angle variation, and rig position were investigated during the Calibration Phase. Data were obtained at free-stream Mach numbers from 0.6 to 1.4 for the Verification Phase and from 0.3 to 1.6 for the Calibration Phase.

The purpose of this report is to document the test and to describe the test parameters. The report provides information to permit the use of the data, but does not include any data analysis, which is beyond the scope of this report. The final data from this test have been transmitted to AEDC/DOFA. Requests for these data should be addressed to AEDC/DOFA, Arnold Air Force Station, Tennessee 37389. A microfilm copy of the final data is on file at the AEDC.

2.0 APPARATUS

2.1 TEST FACILITY

2.1.1 General

The AEDC Propulsion Wind tunnel (16T) is a variable density, continuous-flow tunnel capable of being operated at Mach numbers from 0.06 to 1.60 and stagnation pressures from 120 to 4000 psfa. The maximum attainable Mach number can vary slightly depending upon the tunnel pressure ratio requirements with a particular test installation. The maximum stagnation pressure attainable is a function of Mach number and available electrical power. The tunnel stagnation temperature can be varied from about 80°F to 160°F depending upon the cooling water temperature. The tunnel is equipped with a scavenging system which removes combustion products when testing rocket motors or turbo-engines.

2.1.2 Test Cart

The test cart used during this test was the PWT Multipurpose Cart (Cart 2) configured for CTS testing and designated Cart 2C. The Cart 2 test section is 16 ft square by 40 ft long and enclosed by 60- deg inclined-hole perforated walls of six-percent porosity. Although the Cart 2 test section has a sidewall angle variation capability from -1.5-deg convergence to 1.0-deg divergence, the test included only wall angles of 0.0 deg and 0.5 deg. To compensate for the tunnel blockage caused by the CTS strut and boom, the Cart 2C sidewalls have a bulge section that increased the tunnel width (in the strut area) 7.3 inches relative to the test section centerline. The general arrangement of Cart 2C with the test article for the Verification Phase installed is shown in Fig. 1a. Tunnel locations of the CTS system and the cart bulge geometry are shown in Figs. 1b and 1c, respectively. Additional information about the tunnel, its capabilities, and the operating characteristics is presented in Ref. 1.

2.2 CAPTIVE TRAJECTORY SUPPORT SYSTEM

Aerodynamic loads and captive trajectory testing were conducted using the CTS to support the store model. The tunnel Vertical Propulsion Balance (VPB) with the GAM II strut was installed to support the simulated aircraft model, which was a flat plate with pylons. Presented in Fig. 2 is a block diagram of the computer network used to control the CTS system while an isometric drawing of a typical CTS installation in Tunnel 16T along with the limits of the various degrees of freedom of the system is given in Fig. 3. The maximum linear and angular velocities of the six degrees of freedom are listed in Table 1. For additional information concerning the operation of the CTS system, see Ref. 2.

2.3 TEST ARTICLES

The test articles were a 1/4-scale Maximum Volume Bomb (MVB) store model and a flat plate (simulated) aircraft model. The details of the store model showing its primary dimensions and component parts is presented in Fig. 4. The MVB was sting-mounted on the PWT CTS system using a 10-in. offset sting. The flat plate had two "boiler plate" pylons installed on it -- one at BETA = 0 deg and one at BETA = -10 deg. The flat plate was mounted on the PWT GAM II strut. The general arrangement of the simulated aircraft model showing its primary dimensions and component parts is presented in Fig. 5.

The store model was installed during the structural integrity testing and for that part of the calibration testing which coincided with the structural integrity testing. The store model, the aircraft model, and the GAM II strut were installed for the grid and trajectory testing. The majority of the calibration testing was done with the MVB, the balance, and the GAM II strut removed. The Angular Drive Mechanism (ADM) remained at zero during the calibration testing.

2.4 INSTRUMENTATION

2.4.1 General

Six closed circuit television cameras (3 black and white, 3 color) were used to observe critical hardware areas for vibration, especially the MVB model, the CTS boom, and the hydraulic lines to the CTS boom drive motors.

All steady-state measurements were recorded by an on-line computer system, and the data were reduced to engineering units and tabulated in the control room. Model attitude and strain gage- measured loads were also input to a real-time digital data acquisition system for monitoring of the parameters during test operations.

2.4.2 Verification Phase

Instrumentation for structural integrity testing consisted of three 3-component [x,y,z] and two 2-component [y,z] accelerometers as shown in Fig. 1b. Three of the accelerometers were mounted approximately 7-ft aft of the ADM pitch center, and two were mounted 9-in. forward of the aft end of the CTS boom along the tunnel centerline. The function of the accelerometers was to monitor boom dynamic oscillations throughout the test. The output of the accelerometers was recorded on magnetic tape for off-line analysis. All readings were available for on-line analysis using a Hewlett Packard (HP) 5423A structural analyzer.

Instrumentation for grid and trajectory testing consisted of a six-component strain-gage balance which was used to measure the forces and moments acting on the MVB model. Both pylons on the aircraft model contained two optical proximity sensors which enabled the store model to be accurately positioned for launch. The CTS system was wired to automatically stop the CTS rig motion should the MVB model or sting support make contact with any surfaces. Primary angle-of-attack measurement of the aircraft model was obtained using a strut-mounted Shaevitz® angular position indicator.

2.4.3 Calibration Phase

A total of 122 static pressures were measured using individual Setra® transducers connected to orifice tubes in the tunnel walls. There were 17 orifices located on the tunnel floor centerline of the Transition Region and 105 located on the floor and ceiling of the test section. The location and arrangement of the pressure orifices are shown in Figs. 6, 7, and 8. The locations of the orifices are listed in Tables 2 and 3.

3.0 TEST DESCRIPTION

3.1 TEST CONDITIONS

3.1.1 Verification Phase

Grid and trajectory data were obtained for Mach numbers from 0.7 to 1.1 at stagnation pressures of 574, 939, 1200, and 1419 psfa. Structural integrity data were obtained for Mach numbers from 0.6 to 1.4 at stagnation pressures of 400, 540, 550, and 1600 psfa. A matrix listing test conditions is presented in Tables 4a and 4b for the structural integrity and the grid and trajectory runs, respectively. A description of each configuration is identified by a configuration number listed in Table 5.

3.1.2 Calibration Phase

Calibration data were obtained at Mach numbers form 0.3 to 1.6, at stagnation pressures of 400, 540, 550, 1200, and 1600 psfa, at wall angles of 0.0 and 0.5 deg, and at various compressor pressure ratios (CPR). A matrix of the test conditions is presented in Table 6.

3.2 DATA ACQUISITION AND REDUCTION

3.2.1 Verification Phase

3.2.1.1 Structural Integrity Data

Structural integrity data were obtained - with the CTS rig at selected positions in its operating envelope - using accelerometers mounted on the CTS boom. The data were continuously recorded onto magnetic tape for off-line analysis. On-line analysis of the data was available through the HP analyzer. A run number summary of the structural integrity data is presented in Table 7a. It includes tunnel operating conditions and the CTS rig position for each run.

3.2.1.2 Captive Trajectory Data

To obtain a trajectory, test conditions were first established in the tunnel. Data from the tunnel, consisting of measured store model forces and moments, wind tunnel operating conditions, and the CTS rig positions, were input to the digital computer for use in the full-scale trajectory calculations. In applying the wind tunnel data to the calculations of the full-scale trajectories, the measured forces and moments are reduced to coefficient form and then adjusted with proper full-scale store dimensions and flight dynamic pressure. The dynamic pressure was calculated using a flight velocity equal to the full-scale aircraft simulated velocity plus the components of store velocity relative to the aircraft, and a density corresponding to the simulated altitude.

3.2.1.3 Grid Data

To obtain store grid data, test conditions were first established in the tunnel. Operational control of the store model support systems was then switched to the digital computer. For free-stream data, the computer would position the store at selected angles of attack through commands to the CTS system (see block diagram, Fig. 2). No data were taken in the aircraft model flow field. A run number summary of the captive trajectory data and the grid data is presented in Table 7b.

3.2.2 Calibration Phase

Calibration data (and structural integrity data) were obtained with the CTS rig positioned full aft, midway, and full forward axially on the tunnel centerline. Similar data were obtained 4.5 ft east of the tunnel centerline and 4.3-ft above the tunnel centerline to assess the effects of hte CTS boom and strut location on the tunnel calibration. A run number summary of the calibration data is presented in Table 8.

The distribution of local Mach number along the test section centerline was obtained by reducing the wall static pressure data to Mach number, assuming isentropic flow through the nozzle. The calibration of Tunnel 16T test section centerline is based on the measured differential pressure between the test section and the plenum chamber at the various operating conditions. As a matter of procedure, an equivalent plenum chamber Mach number was calculated from plenum chamber and stagnation pressure measurements using the isentropic relationship. A calibration parameter is defined as the difference between the average Mach number as determined by wall static pressures over a defined region of the test section and the equivalent plenum chamber Mach number. This parameter (M_a-M_c) is utilized to express the tunnel calibration for various operating conditions.

3.3 CORRECTIONS

Balance, sting, and support linear and angular deflections caused by the aerodynamic loads on the store model during the captive trajectory testing were accounted for in the data reduction program to calculate the true store-model angles and positions. Corrections were also made for model weight tares to calculate the net aerodynamic forces on the store model.

3.4 UNCERTAINTIES/PRECISION OF MEASUREMENTS

3.4.1 General

Uncertainties (combinations of systematic and random errors) of the basic tunnel parameters were estimated from repeat calibraitons of the instrumentation and from the repeatability and uniformity of the test section flow during tunnel calibration. Uncertainties in the instrumentation systems were estimated from repeat calibrations of the systems against secondary standards whose uncertainties are traceable to the National Bureau of standards calibration equipment.

3.4.2 Verification Phase

The uncertainties in store positioning based on the ability of the CTS to set a specific value were estimated to be ±0.03 ft (full-scale equivalent) in X, Y, and Z, and ±0.10 deg in pitch and yaw, and ±0.5 deg in roll. The estimated uncertainty in the simulated aircraft model angle of attack was ±0.1 deg.

The trajectory data are subject to error from several sources including tunnel conditions, balance measurements, computer inputs, and CTS positioning control. The maximum estimated uncertainties in the full-scale position data of the MVB store caused by the balance inaccuracies are given in Table 9a.

For the grid data, the balance uncertainties, based on a 95- percent confidence level, were combined with the uncertainties in the tunnel parameters using a Taylor series method of error propagation (Ref. 3), to estimate the uncertainties of the store aerodynamic coefficients which are presented in Table 9b.

3.4.3 Calibration Phase

A Taylor series method of error propagation was used to estimate the uncertainty in the calibration parameters which could be attributed to instrumentaiton errors and data acquisition techniques. The uncertainties in the calibration parameters presented in Table 10 are for a confidence level of 95 percent.

4.0 DATA PACKAGE PRESENTATION

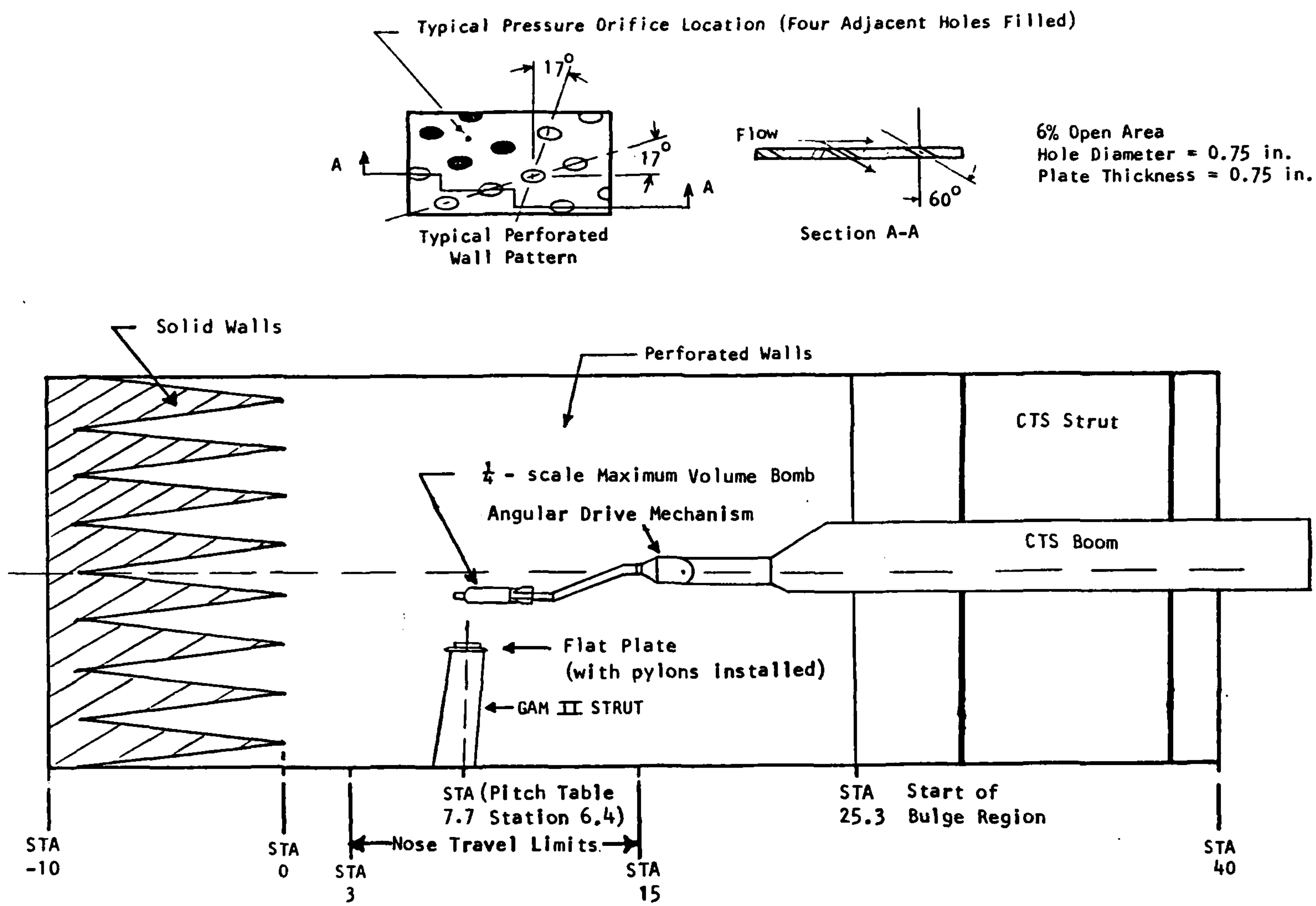
The data package contained 1) tabulated summary data, 2) a data nomenclature defining all parameters on the summary data sheets, 3) data film for both phases, 4) a test log for identification of test run numbers, test conditions, and test article configurations, 5) test article installation photographs, 6) all summary data on digital magnetic computer tapes, and 7) accelerometer recordings on analog magnetic tape. Configuration identification is repesented in Table 5. Run number summary and configuration correlations are presented in Tables 4 and 6. Tabulated summary data formats and associated nomenclature are presented in Tables 11 through 16.

REFERENCES

1. Test Facility Handbook (Twelfth Edition). "Propulsion Wind Tunnel Facility, Vol. 4." Arnold Engineering Development Center, March 1984.

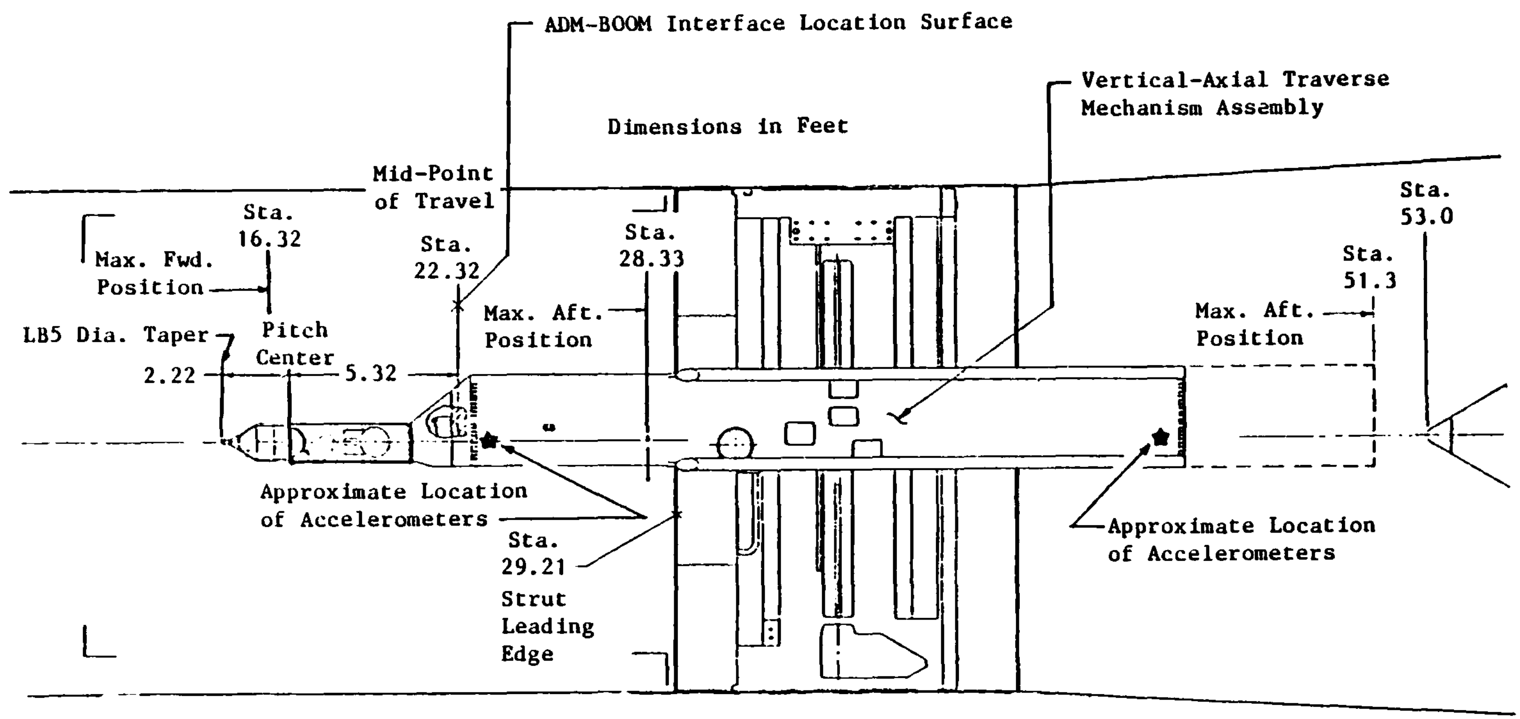
2. Carman, Jack B. "Store Separation Testing Techniques at the Arnold Engineering Development Center, Volume II: An Overview." AEDC-TR-79-1, June 1980.

3. Abernethy, R. B. and Thompson, J. W., Jr. "Handbook - Uncertainty in Gas Turbine Measurements." AEDC-TR-73-5 (AD755356), February 1973.



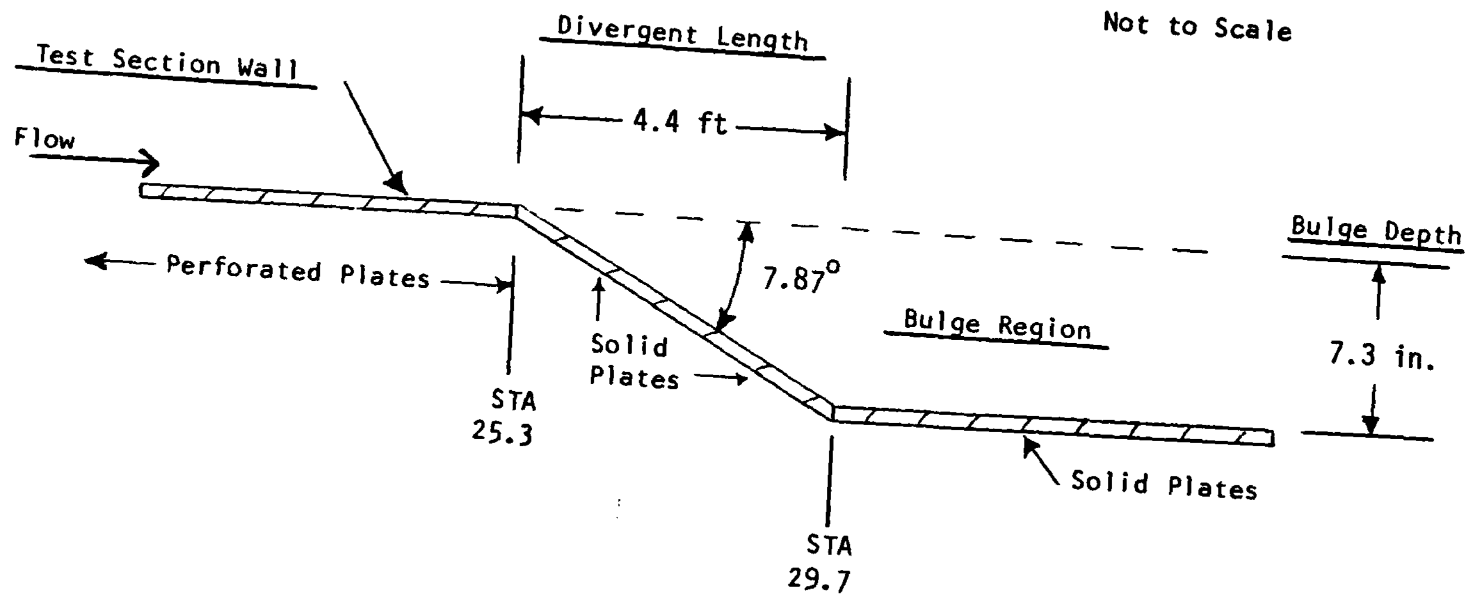
a. CTS and Test Article Installation

Figure 1. Cart 2C Arrangement



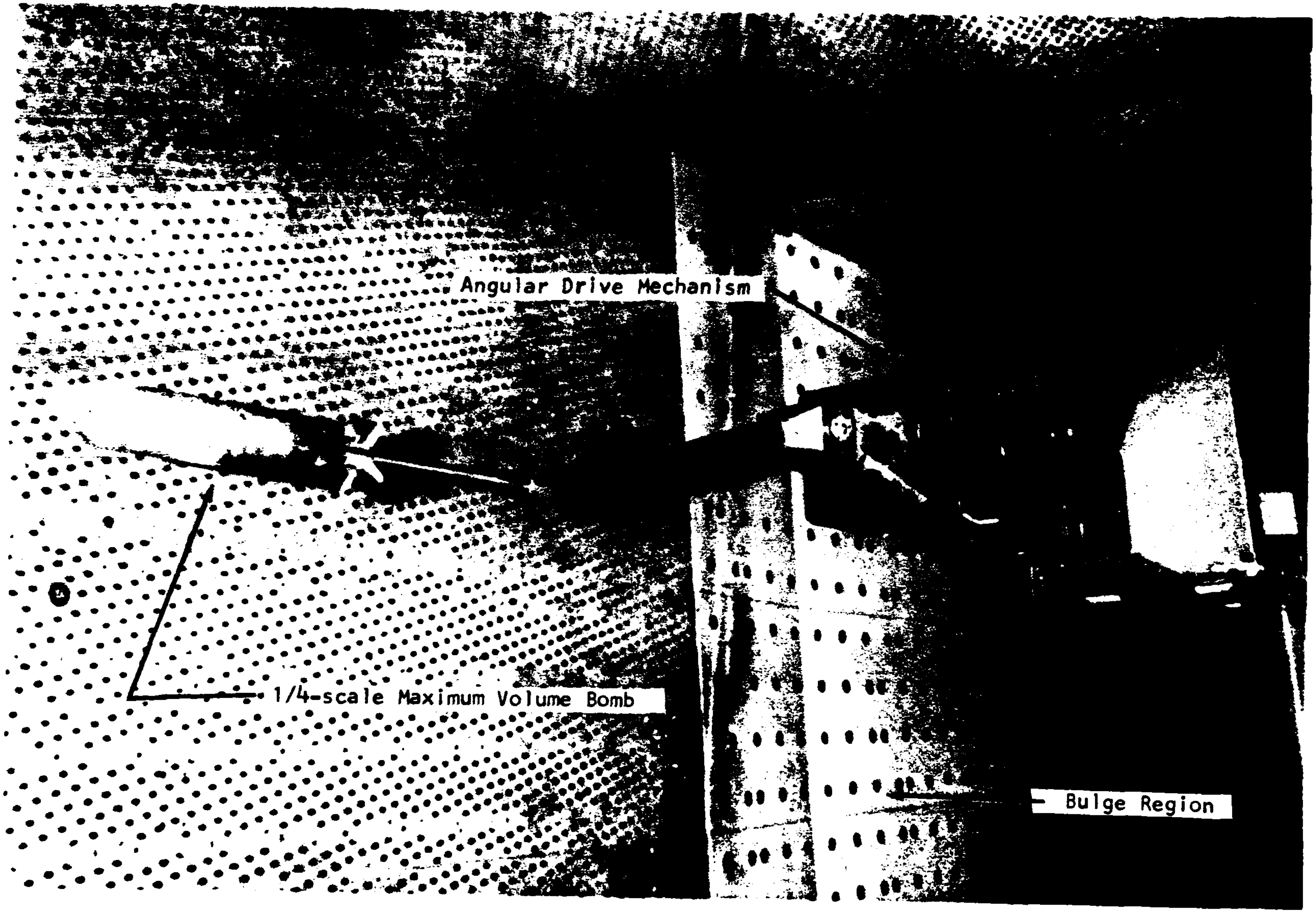
b. Tunnel Location of the CTS System

Figure 1. Continued



c. Cart 2C Test Section Bulge Geometry

Figure 1. Continued



d. Test Article Installation in Tunnel 16T

Figure 1 concluded

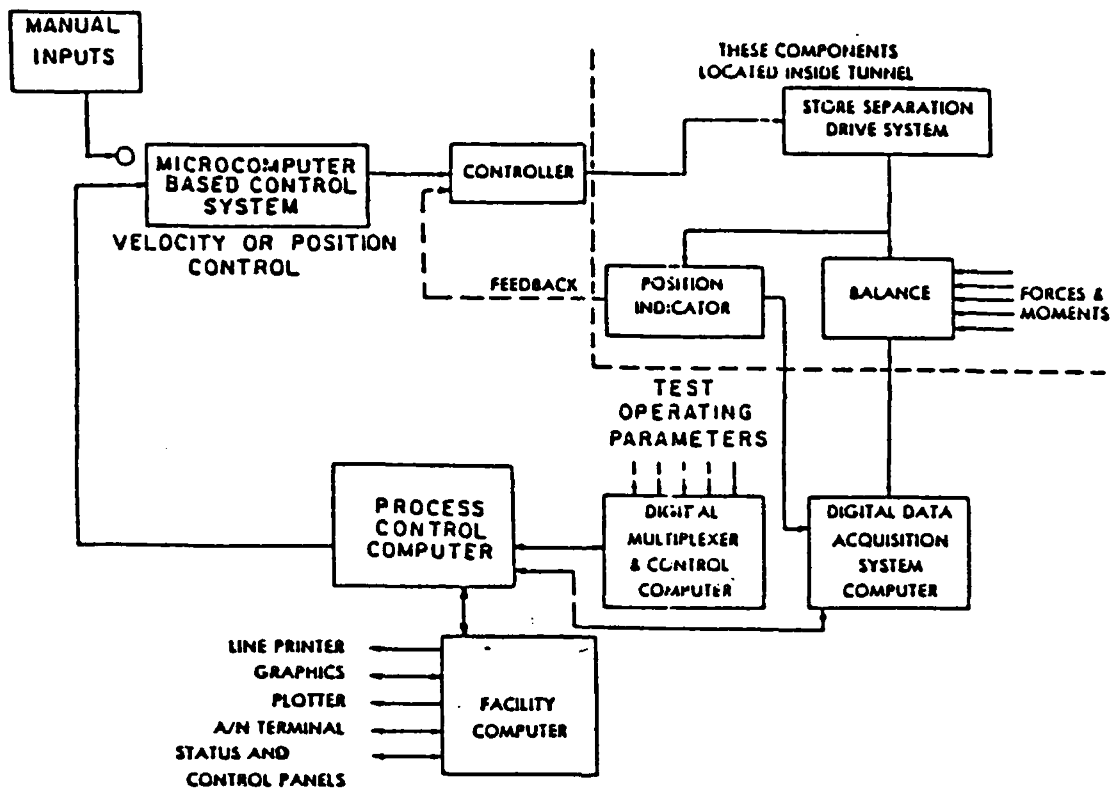


Figure 2. Block Diagram of the Computer Network for CTS Control

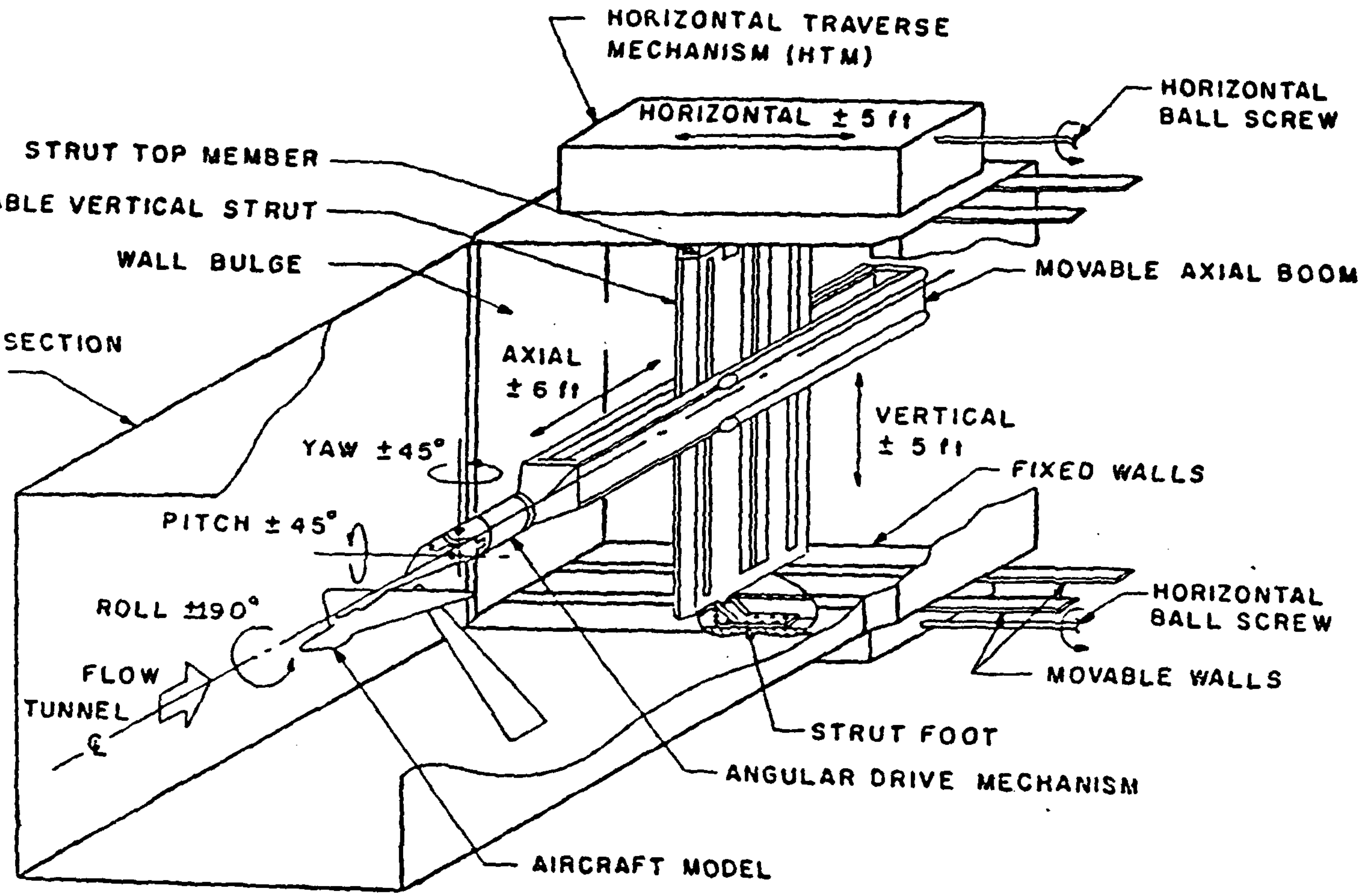


Figure 3. Tunnel 16T CTS installation and travel limits

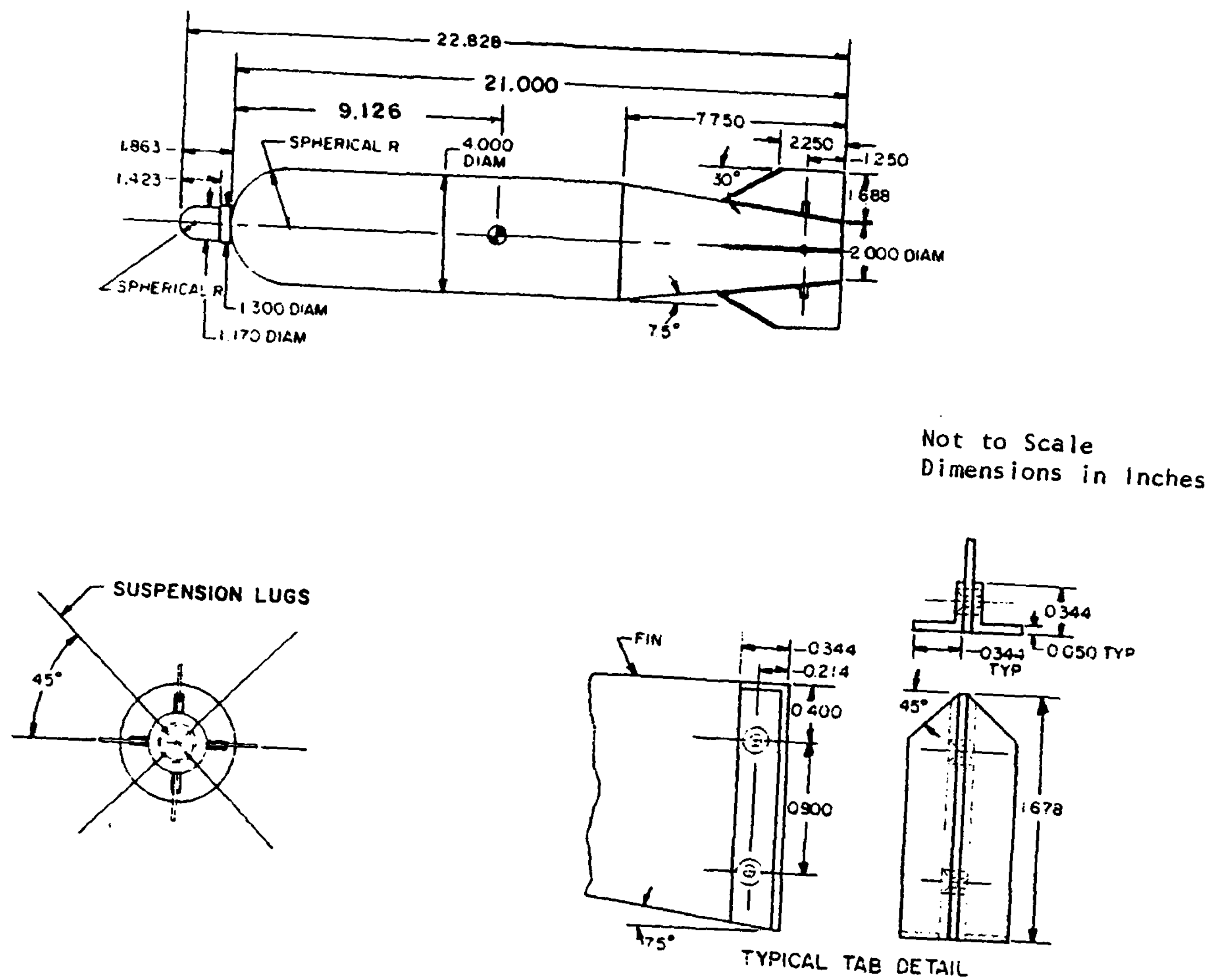


Figure 4. Details and Dimensions of the 0.25-Scale MVB Model

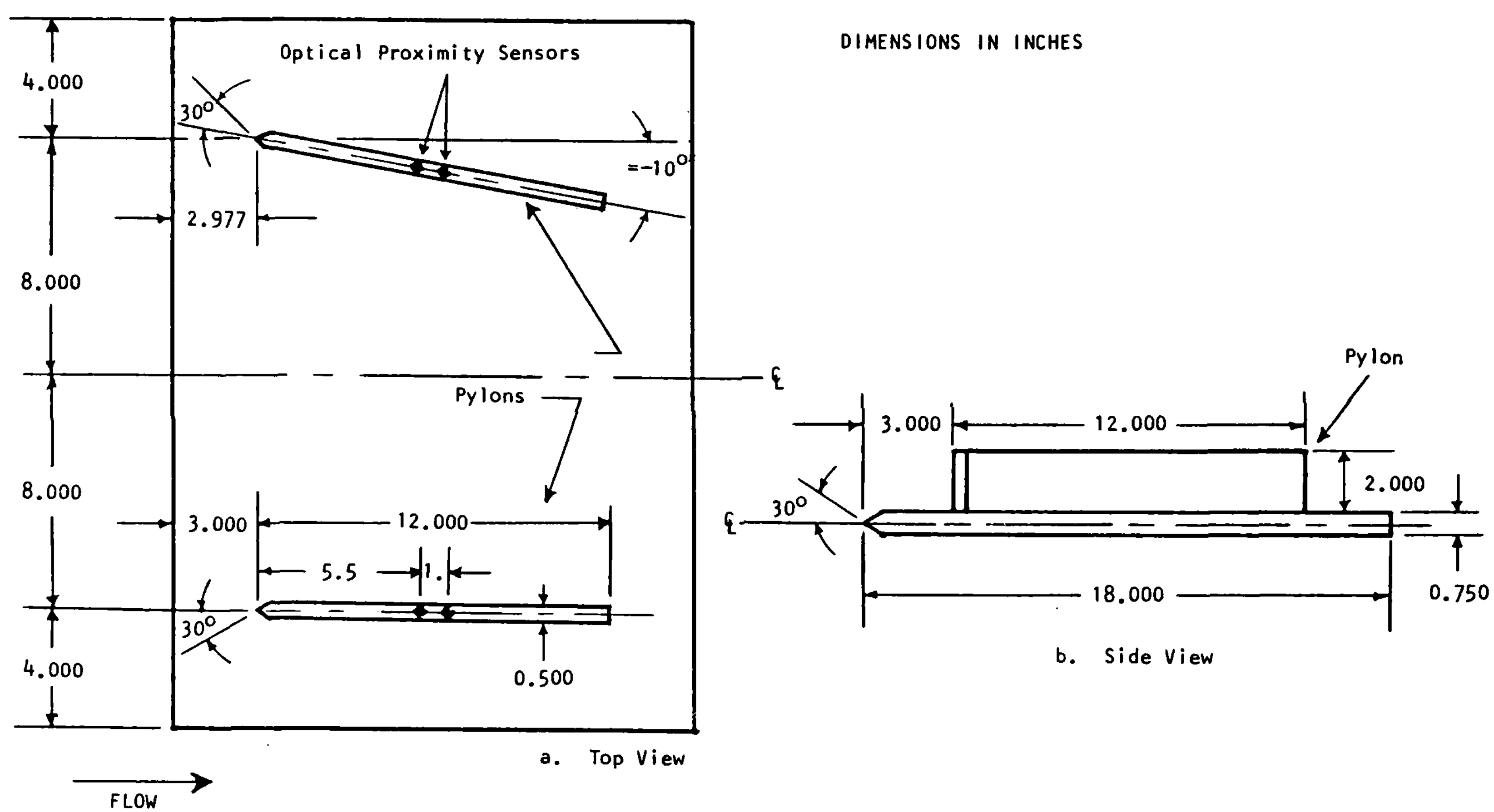
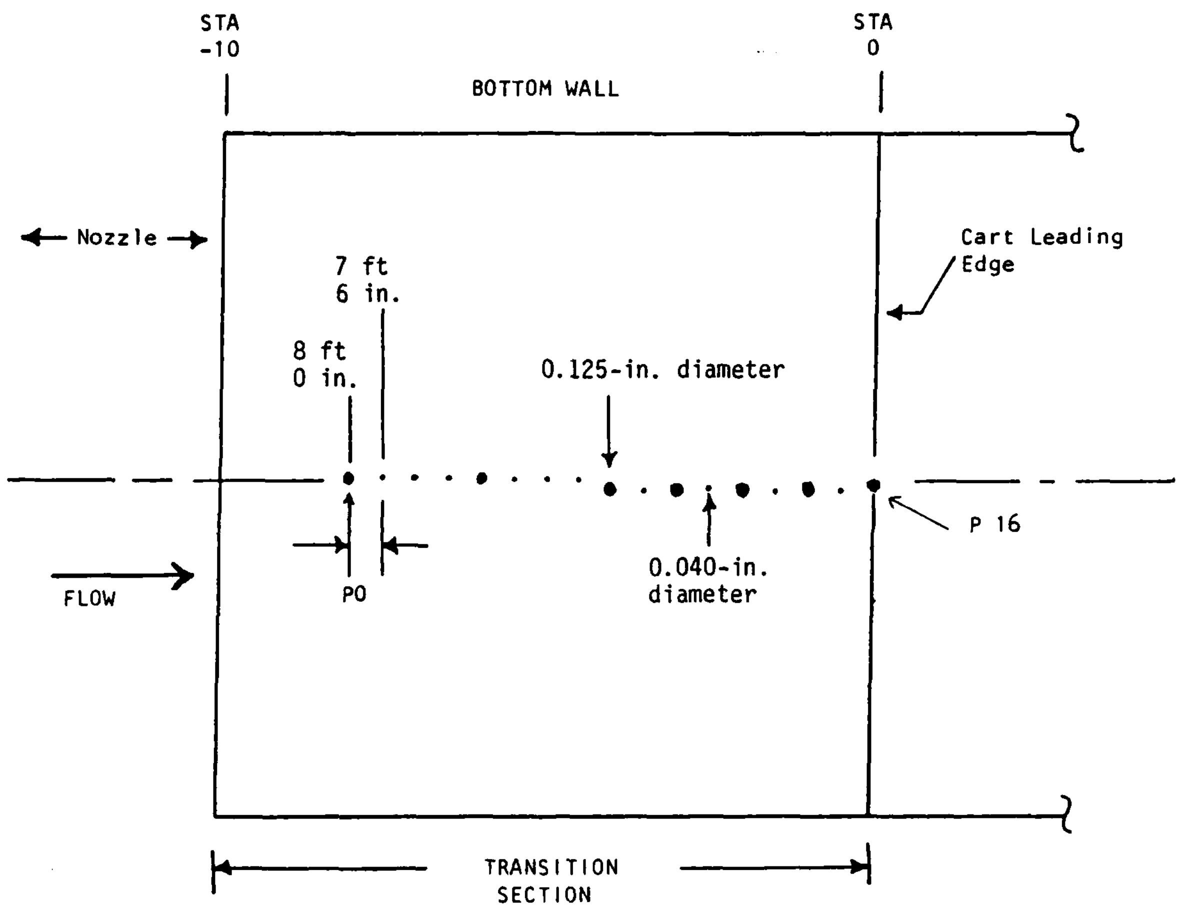
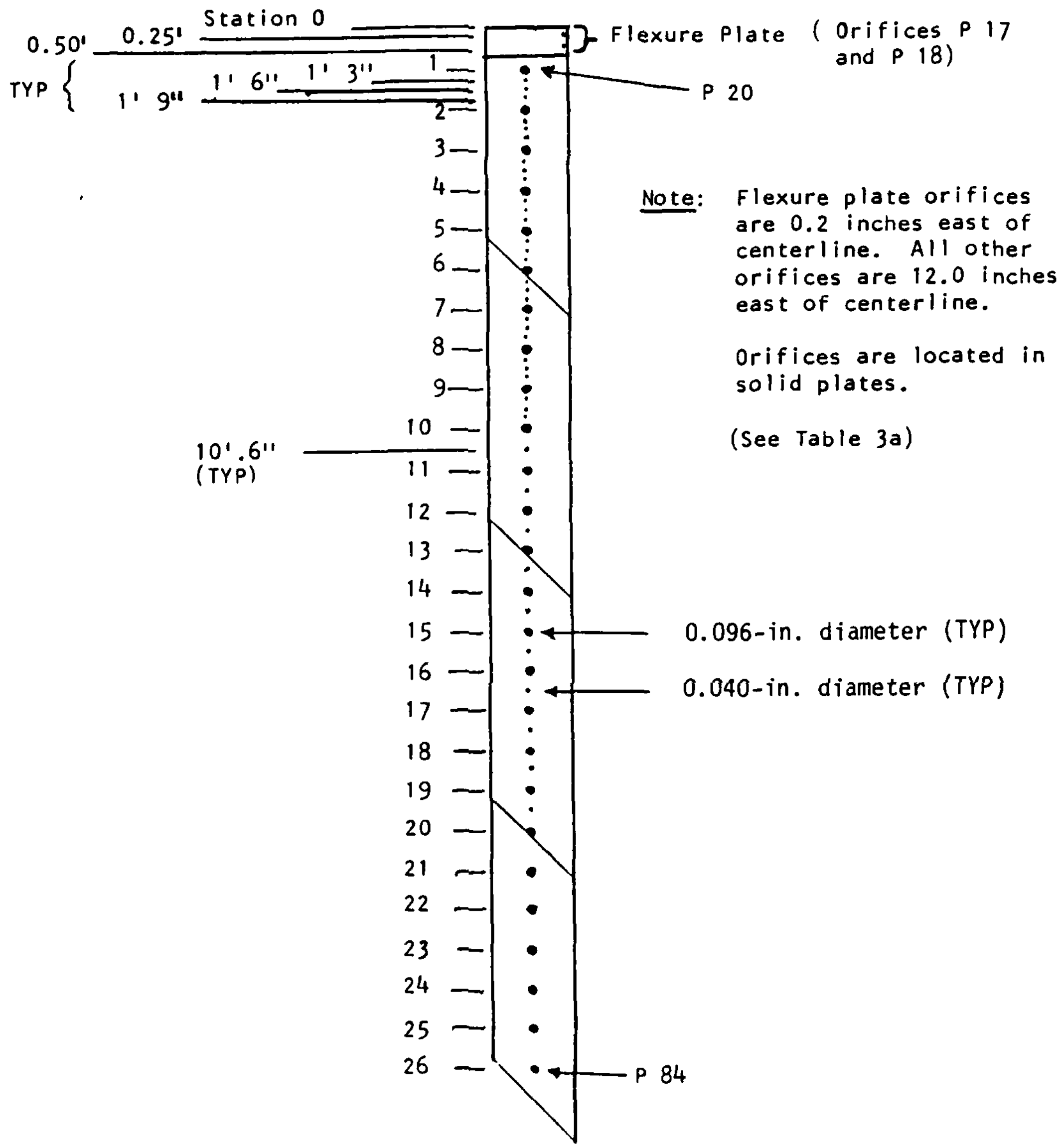


Figure 5. Details and Dimensions of the Simulated Aircraft Model



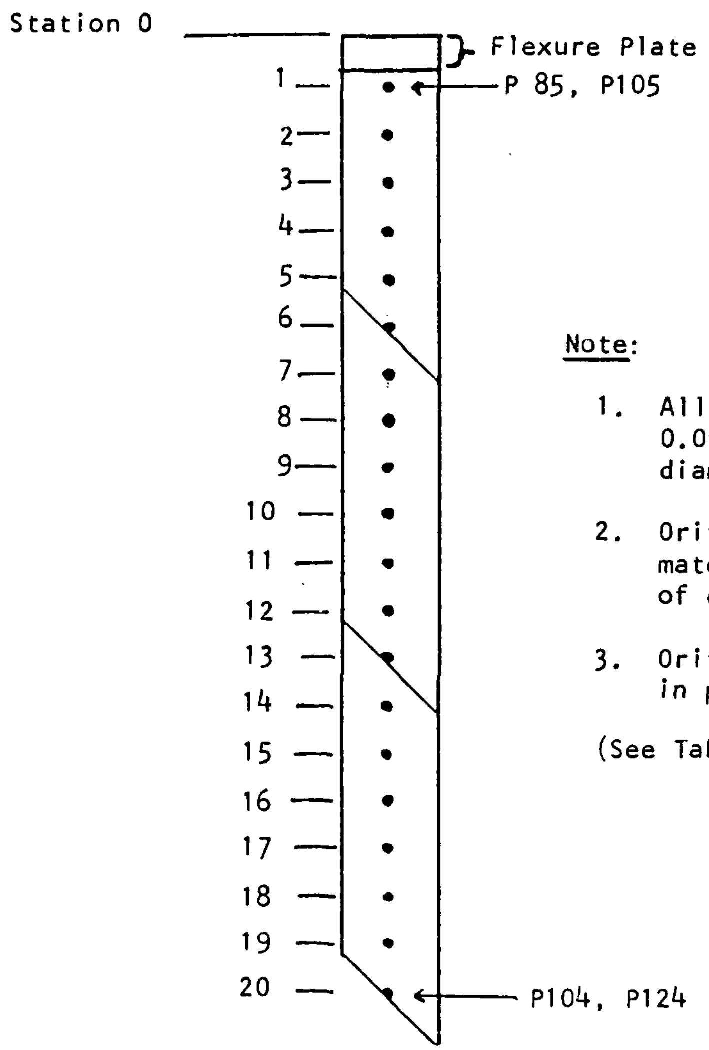
Note: All orifices are not on the tunnel centerline. (See Table 2)

Figure 6. Tunnel 16T Transition Section Static Pressure Orifice Location



a. Bottom Wall Orifices East of Centerline

Figure 7. Cart 2C Test Section Static Pressure Orifice Locations



Note:

1. All orifices are 0.096 inches in diameter.

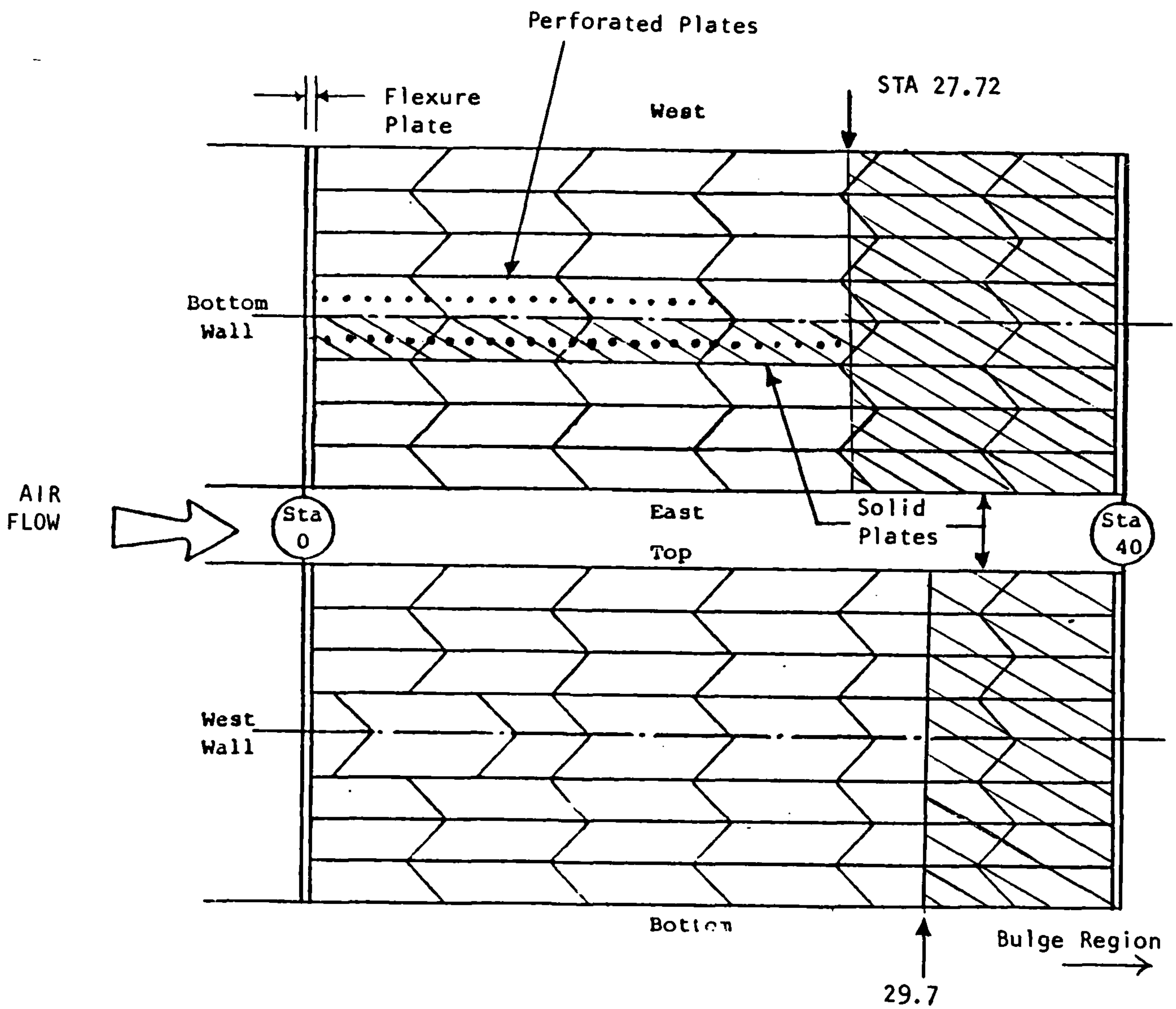
2. Orifices are approximately 12 inches west of centerline.

3. Orifices are located in perforated plates.

(See Table 3b)

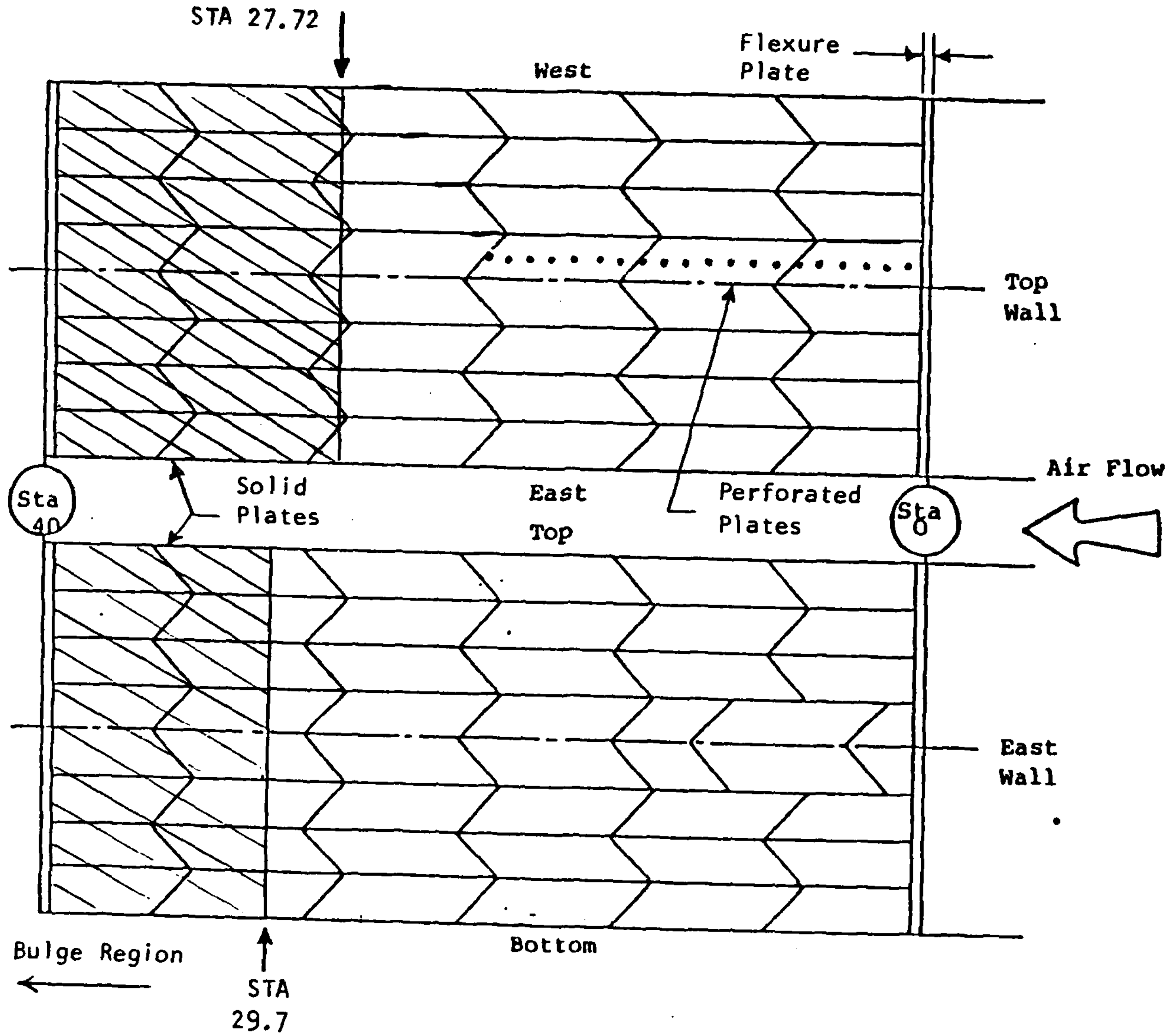
b. Top/Bottom Wall Orifices West of Centerline

Figure 7. Concluded



a. Bottom and West Walls

Figure 8. Cart 2C Test Section Static Pressure Orifice Arrangements



b. Top and East Walls

Figure 8. Concluded

Table 1. Maximum Linear and Angular Velocities of the Six Degrees of Freedom of the CTS System

Component	Velocity
X_R, Axial	7 in/sec
Y_R, Horizontal	2 in/sec
Z_R, Vertical	2 in/sec
ϑ_R, Pitch	0.9 deg/sec
η_R, Yaw	1.1 deg/sec
ω_R, Roll	10 deg/sec

Table 2. Transition Section Wall Static Pressure Orifice Locations

FLOOR - SOLID PLATE

ORIFICE	TEST STATION (ft)	DISTANCE FROM C_L (EAST) (in)
P 0	-8.0	0
P 1	-7.5	0
P 2	-7.0	0
P 3	-6.5	0
P 4	-6.0	0
P 5	-5.5	0
P 6	-5.0	0
P 7	-4.5	0
P 8	-4.0	2.0
P 9	-3.5	1.9
P 10	-3.0	2.0
P 11	-2.5	2.0
P 12	-2.0	2.0
P 13	-1.5	2.0
P 14	-1.0	2.0
P 15	-0.5	2.0
P 16	0.0	0.8

Table 3. Test Section Wall Static Pressure Orifice Locations

a. Solid Plates

Floor

Orifice	Test Station (ft.)
P 17	0.25
P 18	0.50
P 20	1.00
P 21	1.25
P 22	1.50
P 23	1.75
P 24	2.00
P 25	2.25
P 26	2.50
P 27	2.75
P 28	3.00
P 29	3.25
P 30	3.50
P 31	3.75
P 32	4.00
P 33	4.25
P 34	4.50
P 35	4.75
P 36	5.00
P 37	5.25
P 38	5.50
P 39	5.75
P 40	6.00
P 41	6.25
P 42	6.50
P 43	6.75
P 44	7.00
P 45	7.25
P 46	7.50
P 47	7.75
P 48	8.00
P 49	8.25
P 50	8.50
P 51	8.75
P 52	9.00

Floor

Orifice	Test Station (ft.)
P 53	9.25
P 54	9.50
P 55	9.75
P 56	10.00
P 57	10.50
P 58	11.00
P 59	11.50
P 60	12.00
P 61	12.50
P 62	13.00
P 63	13.50
P 64	14.00
P 65	14.50
P 66	15.00
P 67	15.50
P 68	16.00
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P 72	18.00
P 73	18.50
P 74	19.00
P 75	19.50
P 76	20.00
P 78	21.00
P 80	22.00
P 81	23.00
P 82	24.00
P 83	25.00
P 84	26.00

NOTE:

1. Orifice P 17 and P 18 are 0.2 inches east of centerline.
2. All other orifices are 12.0 inches east of centerline.

Table 3. Concluded

b. Perforated Plates

FLOOR

ORIFICE	TEST STATION (INCHES)	DISTANCE FROM ℄ (INCHES)
P 85	12.080	12.000
P 86	24.340	13.125
P 87	36.560	14.500
P 88	47.980	13.250
P 89	59.560	12.475
P 90	71.600	13.375
P 91	83.000	12.186
P 92	96.800	11 375
P 93	109.100	12.700
P 94	120.680	11.500
P 95	132.100	10.450
P 96	143.080	11.700
P 97	156.100	10.685
P 98	167.670	11.750
P 99	179.780	13.125
P100	191.940	11.875
P101	205.400	11.625
P102	214.980	12.090
P103	228.630	11.750
P104	238.700	12.250

CEILING

ORIFICE	TEST STATION (INCHES)	DISTANCE FROM ℄ (INCHES)
P105	11.620	12.000
P106	21.360	12.000
P107	34.960	12.000
P108	49.960	13.000
P109	58.920	12.000
P110	71.000	13.125
P111	83.160	12.000
P112	97.060	12.375
P113	108.600	11.125
P114	118.160	13.000
P115	130.300	11.750
P116	142.260	12.750
P117	158.500	12.500
P118	168.140	12.000
P119	180.300	10.750
P120	192.000	12.000
P121	205.900	12.500
P122	215.500	12.000
P123	229.100	12.500
P124	239.100	11.750

Table 4. Verification Phase Test Condition Matrix

a. Structural Integrity

MACH	PT	CPR	WA
0.6	400,1600	As Req'd.	0.5
0.8	400,1600	1.17-1.21	0.0,0.5
0.9	400,1600	1.20-1.24	0.5
0.95	400,1600	1.21-1.23	0.5
1.05	400,1600	1.22-1.30	0.5
1.2	400,1600	1.26-1.30	0.5
1.4	400,540 550,1600	1.34-1.40	0.5

Table 4. Concluded

b. Grid and Trajectory

MACH	PT	ALPHA	CONFIG.
0.7	1200,1419	0,5	2,3,4
0.9	574,1200	5	2
1.1	1200	5	4

Note: There is no ALPHA associated with Configuration 2. (See Table 5)

Table 5. CONFIGURATION IDENTIFICATION DESCRIPTION

CONFIG.	Description
1	Calibration and Structural Integrity - CTS with - 10 inch offset roll - no balance, no aircraft
2	Grid and Trajectory Verification - 1/4 - scale MVB on 10-inch offset roll mechanism - no GAM II strut
3	Grid and Trajectory Verification - flat plate "aircraft" installed - Launch MVB from 0 degree yaw pylon
4	Grid and Trajectory Verification - flat plate "aircraft" installed - Launch MVB from - 10 degree yaw pylon

Table 6. Calibration Phase Test Condition Matrix

WA	PT	MACH	CPR
0.0	1200	1.2	1.31
0.0	1200	0.3 - 0.8	1.04 - 1.27
0.5	400	0.6 - 1.2	1.11 - 1.30
0.5	550	1.4	1.37 - 1.40
0.5	1200	0.3 - 1.6	1.04 - 1.42
0.5	1600	0.6 - 1.4	1.12 - 1.34

Table 7. Verification Phase Run Number Summary

a. Structural Integrity Data

RUN	MACH	PT	WA	CPR	X	Y	Z	COMMENT
490	0.6	400	0.5	As Req'd.	FOR	0	0	
491					AFT			
492					FOR		4.3	
493					AFT			
494					FOR	-4.5	0	
495					AFT			
496,497					FOR		4.3	
498					AFT			
541		1600				0	0	
543							4.3	
499	0.8	400		1.21	AFT		0	*Plenum suction used on all*
501			0.0					subsequent test conditions.
544		1600	0.5	1.17				
545				1.19			4.3	
546						-4.5		
506	0.9	400		1.21	MID	0	0	
508					AFT			
509					FOR		4.3	
510				1.22	AFT			
511				1.23	FOR	-4.5	0	
513					AFT			
514				1.24	FOR		4.3	
515					AFT			
547		1600		1.20	MID	0	0	

Table 7. Continued

RUN	MACH	PT	WA	CPR	X	Y	Z	COMMENT
548	0.9	1600	0.5	1.20	AFT	0	0	
549				1.21			4.3	
550						-4.5		
516	0.95	400		1.23		0	0	
553		1600		1.21				
518	1.05	400		1.22				
554		1600		1.23				
519	1.20	400		1.27	FOR			
520							4.3	
521				1.30		-4.5	0	
522							4.3	
524					AFT			
525							0	
526						0	4.3	
527							0	
555		1600		1.26				
557							4.3	
558						-4.5		
528	1.4	540		1.37	FOR	0	0	
530		550					4.3	
531				1.40		-4.5	0	
532							4.3	
533					AFT			
534							0	

Table 7. Continued

RUN	MACH	PT	WA	CPR	X	Y	Z	COMMENT
535	1.40	550	0.5	1.40	AFT	0	4.3	
536							0	
559		1600		1.34			4.3	
560						-4.5		
561								

Note: For - Boom at forward limit (ADM Pitch Center at Station 11.5')
Mid - Boom at mid-travel (ADM Pitch Center at Station 17.0')
AFT - Boom at aft limit (ADM Pitch Center at Station 22.5')
4.3 - Boom 4.3 ft above test section centerline
-4.5 - Boom 4.5 east of the test section centerline

See Figure 1b

Table 7. Concluded

b. Grid and Trajectory Data

RUN	MACH	PT	ALPHA	CONFIG	COMMENTS
953	0.9	1200	---	2	GRID - Flow Angle Checks
954 - 967	↓	574	---	↓	GRID - Digital Filtering
968 - 969	↓	↓	---	↓	GRID - Flow Angel Checks
972 - 975	↓	↓	---	↓	GRID - Digital Filtering
981	0.7	1419	---	↓	TRAJECTORY - Digital Filtering
1103	↓	1200	0	3	TRAJECTORY - With Flat Plate BETA = 0
1104 - 1105	↓	↓	5	4	TRAJECTORY - With Flat Plate BETA = -10
1110	1.1	↓	↓	↓	TRAJECTORY - With Flat Plate BETA = -10

Table 8. Calibration Phase Run Number Summary

RUN	MACH	PT	WA	CPR	X	Y	Z	COMMENT
564	0.3	1200	0.5	As Req'd	MID	0	0	
565					FOR			
566					AFT			
601			0.0		MID			
602					FOR			
603					AFT			
490	0.6	400	0.5		FOR			
491					AFT			
492					FOR		4.3	
493					AFT			
494					FOR	-4.5	0	
495					AFT			
496,497					FOR		4.3	
498					AFT			
568		1200			MID	0	0	
569,1010					AFT			
570					FOR			
597			0.0		MID			
598					FOR			
599					AFT			
541		1600	0.5					
543							4.3	
572	0.7	1200			MID		0	
573					FOR			

Table 8. Continued

RUN	MACH	PT	WA	CPR	X	Y	Z	COMMENT
574,1009	0.7	1200	0.5	As Req'd	AFT	0	0	
576	0.75				MID			
577					AFT			
579,581				1.19,1.20	FOR			
580				1.17				Plenum Suction used on all
499,500	0.80	400		1.21	AFT			subsequent test conditions
501			0.0					
583		1200	0.5	1.19	MID			
584					FOR			
585				1.22				
586				1.23				
587,1006				1.21	AFT			Maximum CPR
588				1.18				
589			0.0		MID			
590					AFT			
591					FOR			
592				1.22				
593				1.24				
594				1.23	MID			
595				1.21	AFT			
544		1600	0.5	1.17	AFT			
545				1.19			4.3	
546						-4.5		
506	0.9	400		1.21	MID	0	0	

Table 8. Continued

RUN	MACH	PT	WA	CPR	X	Y	Z	COMMENT
508	0.9	400	0.5	1.21	AFT	0	0	
509				↓	FOR		4.3	
510				1.22	AFT	↓	↓	
511				1.23	FOR	-4.5	0	
513				↓	AFT		↓	
514				1.24	FOR		4.3	
515		↓		↓	AFT	↓	↓	
615,1008		1200		1.27	AFT	0	0	
616					MID			
617			↓	↓	FOR			
608			0.0	1.23	MID			
609				↓	FOR			
610				1.27				
611				1.19	↓			
612				1.27	MID			
613				↓	AFT			
614		↓	↓	1.22	↓			
547		1600	0.5	1.20	MID			
548				↓	AFT		↓	
549				1.21		↓	4.3	
550	↓	↓		↓		-4.5	↓	
516	0.95	400		1.23	↓	0	0	
619,620		1200		1.24	FOR			
621	↓	↓	↓	1.20	↓	↓	↓	

Table 8. Continued

RUN	MACH	PT	WA	CPR	X	Y	Z	COMMENT
622	0.95	1200	0.5	1.25	MID	0	0	
623					AFT			
624					FOR			
553		1600		1.21	AFT			
518	1.05	400		1.22				
626		1200		1.27	FOR			
627				1.31				
628				1.23				
629				1.27	MID			
630					AFT			
631			0.0		MID			
554		1600	0.5	1.23	AFT			
519	1.20	400		1.27	FOR			
520							4.3	
521				1.30		-4.5	0	
522							4.3	
524					AFT			
525							0	
526						0	4.3	
527							0	
634		1200		1.25	FOR			
635				1.29				
636				1.33				
638				1.36				

Table 8. Concluded

RUN	MACH	PT	WA	CPR	X	Y	Z	COMMENT
639	1.20	1200	0.5	1.33	MID	0	0	
640				1.26	AFT			
641		↓		1.31				
555		1600		1.26			↓	
557						↓	4.3	
558	↓	↓	↓	↓	↓	-4.5	↓	
528	1.40	540	0.5	1.37	FOR	0	0	
530		550		↓		↓	4.3	
531				1.40		-4.5	0	
532					↓		4.3	
533					AFT		↓	
534						↓	0	
535						0	4.3	
536		↓		↓			0	
559		1600		1.34			↓	
560						↓	4.3	
561	↓	↓		↓	↓	-4.5	↓	
642	1.50	1200		1.37	MID	0	0	
643	↓			↓	FOR			
644	1.55			1.40	MID			
645	↓			↓	FOR			
646	1.60	↓	↓	1.42	MID	↓	↓	

Note: FOR - Boom at forward limit (ADM Pitch Center at Station 11.5')
MID - Boom at mid-level (ADM Pitch Center at Station 17.0')
AFT - Boom at aft limit (ADM Pitch Center at Station 22.5')
4.3 - Boom 4.3 ft above test section centerline
-4.5 - Boom 4.5 ft to the east of the test section centerline

See Figure 1b

Table 9 Verification Phase Parameter Uncertainties

a. Trajectory Parameter Uncertainties

PARAMETER	UNCERTAINTY		
	MACH = 0.7		MACH = 1.1
	PT = 1200 psfa	PT = 1419 psfa	PT = 1200 psfa
	t = 0.5 sec	t = 0.75 sec	t = 0.18 sec
Uz	± 0.0310	± 0.0584	± 0.0062
Uy	± 0.0239	± 0.0451	± 0.0048
Ux	± 0.0275	± 0.0519	± 0.0055
UTHETA	± 0.7422	± 1.3973	± 0.1476
UPSI	± 0.4786	± 0.9010	± 0.0952
UPHI	± 0.6417	± 1.2080	± 0.1276

Table 9. Concluded

b. Grid Parameter Uncertainties

PARAMETER	UNCERTAINTY	
	MACH = 0.9	
	PT = 574 psfa	PT = 1200 psfa
UCN	± 0.0297	± 0.0058
UCY	± 0.0126	± 0.0042
UCA	± 0.0109	± 0.0053
UCLM	± 0.0122	± 0.0047
UCLN	± 0.0065	± 0.0029
UCLL	± 0.0007	± 0.0003

Table 10. Calibration Phase Parameter Uncertainties

Parameter	Mach Number 0.2	0.6	1.2	1.6
Re x 10^{-6}	$\pm$ 0.020	$\pm$ 0.015	$\pm$ 0.019	$\pm$ 0.018
M_i	$\pm$ 0.0068	$\pm$ 0.0028	$\pm$ 0.0027	$\pm$ 0.0041
M_a	$\pm$ 0.0018	$\pm$ 0.0007	$\pm$ 0.0007	$\pm$ 0.0013
$M_a - M_c$	$\pm$ 0.0039	$\pm$ 0.0018	$\pm$ 0.0020	$\pm$ 0.0029
M	$\pm$ 0.0020	$\pm$ 0.0007	$\pm$ 0.0007	$\pm$ 0.0014

DATE 24-JUL-85 PROJECT NO P41G-06
ARVIN/CALSPAN FIELD SERVICES, INC.
AEDC DIVISION
PROPULSION WIND TUNNEL
ARNOLD AIR FORCE STATION, TENNESSEE

Table 11. Verification Phase Trijectory Summary Data

a. Flight Axis and Body Axis Coefficients

RUN	TRAJ	M	PT	TT	Q	P	T	RE	TDP	SM	SCALE	H	DT	DATE	TIME	CON SET	ZEROSET	TRANSONIC 16T
982	36	0.703	1416.0	109.8	352.3	1018.0	518.2	2.4	8.5	0.0018	0.250	5.0K	0.0025	7/24/85	5:42:30	982/ 1	980/ 1	TEST TF-694

STORE	WT	A	L1	L2	L3	XCG	DXMCG	DXNCG	YCG	ZCG	IXX	IXY	IXZ	IYY	IYZ	IZZ	CLP	CMQ	CNR
MVB	800.	1.396	1.333	1.333	1.333	3.04	0.00	0.00	0.00	0.00	5.7	0.0	0.0	65.0	0.0	65.0	-4.0	-24.0	-24.0

A/C	ALPHA	BETA	NZ	DIVE	BANK	IP	IY	IR	CONFIG	WING	MOTN	NROLL	AUTO	POST	COEF	THRUST	EJECT	XFE	DXAE	DMGM	ZE1	ZE2
F/S	0.00	0.00	1.0	0.0	0.0	0.00	0.00	0.0	2	FUSC	0	0	0	0	0	0	2	2.21	2.67	0.0	0.25	0.25

FLIGHT AXIS POSITIONS AND ORIENTATIONS — BODY AXIS FORCE AND MOMENT COEFFICIENTS — SUMMARY 1

PN	T	X	Y	Z	PSI	THA	PHI	ALPHAS	BETAS	CN	CLM	CY	CLN	CLL	CAT	QA	FE1	FE2
3	0.000	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0.040	-0.035	0.012	-0.013	-0.000	0.528	604.0	0.	2400.
5	0.010	-0.00	0.00	0.01	-0.00	0.19	-0.0	0.29	0.00	0.004	-0.006	0.004	-0.002	-0.001	0.531	603.7	0.	2400.
7	0.020	-0.00	0.00	0.03	-0.00	0.77	-0.0	0.96	0.00	0.037	-0.035	0.002	-0.002	-0.001	0.533	603.4	0.	2400.
8	0.030	-0.01	0.00	0.05	-0.00	1.73	-0.0	2.02	0.00	0.136	-0.126	-0.002	-0.004	-0.001	0.530	603.2	0.	2400.
9	0.040	-0.01	0.00	0.10	-0.00	3.06	-0.0	3.44	0.00	0.228	-0.198	-0.001	-0.001	-0.001	0.539	603.0	0.	2400.
10	0.050	-0.02	0.00	0.16	-0.00	4.69	-0.0	5.12	0.00	0.339	-0.274	-0.003	-0.006	-0.000	0.547	602.7	0.	0.
11	0.060	-0.03	0.00	0.22	-0.01	6.31	-0.0	6.75	0.01	0.478	-0.376	-0.005	-0.008	-0.001	0.543	602.4	0.	0.

DATE 24-JUL-85 PROJECT NO P41G-05
ARVIN/CALSPAN FIELD SERVICES, INC.
AEDC DIVISION
PROPULSION WIND TUNNEL
ARNOLD AIR FORCE STATION, TENNESSEE

Table 11. Concluded

b. Full Scale Velocities and Accelerations

RUN	TRAJ	M	PT	TT	Q	P	T	RE	TOP	SM	SCALE	H	DT	DATE	TIME	CON SET	ZEROSET	TRANSONIC 16T
982	36	0.703	1416.0	109.8	352.3	1018.0	518.2	2.4	8.5	0.0018	0.250	5.0A	0.0025	7/24/85	5:42:30	982/ 1	980/ 1	TEST TF-694

STORE	WT	A	L1	L2	L3	XCG	DXMCG	DXNCG	YCG	ZCG	IXX	IXY	IXZ	IYY	IYZ	IZZ	CLP	CMQ	CNR
MVB	800.	1.396	1.333	1.333	1.333	3.04	0.00	0.00	0.00	0.00	5.7	0.0	0.0	65.0	0.0	65.0	-4.0	-24.0	-24.0

A/C	ALPHA	BETA	NZ	DIVE	BANK	IP	IY	IR	CONFIG	WING	MOTN	NROLL	AUTO	POST	COEF	THRUST	EJECT	XFE	DXAE	OMGM	ZE1	ZE2
F/S	0.00	0.00	1.0	0.0	0.0	0.00	0.00	0.0	2	FUSC	0	0	0	0	0	0	2	2.21	2.67	0.0	0.25	0.25

FULL SCALE VELOCITIES AND ACCELERATIONS SUMMARY 2

PN	T	VX	VY	VZ	UR	U	V	W	P	Q	R	UDOT	VDOT	WDOT	PDOT	QDOT	RDOT
3	0.000	767.9	0.0	0.0	767.9	0.0	0.0	0.0	0.00	0.00	0.00	-17.9	0.4	127.3	0.0	67.1	-0.2
5	0.010	767.8	-0.0	3.8	767.8	-0.2	0.0	1.3	-0.00	0.67	-0.00	-19.0	0.1	128.4	0.0	67.3	-0.0
7	0.020	767.5	0.0	12.9	767.6	-0.4	0.0	2.6	-0.00	1.34	-0.00	-21.9	0.1	126.9	-0.0	66.6	-0.0
8	0.030	767.0	0.0	27.0	767.4	-0.6	0.0	3.8	-0.00	2.01	-0.00	-26.6	-0.1	122.8	0.0	64.8	-0.1
9	0.040	765.9	0.0	46.1	767.3	-0.9	0.0	5.0	-0.00	2.65	-0.00	-33.4	-0.0	118.5	0.0	63.3	-0.0
10	0.050	764.1	0.1	68.4	767.1	-1.3	0.0	5.6	-0.00	2.86	-0.00	-37.2	-0.1	16.9	0.0	-5.8	-0.1
11	0.060	761.6	0.1	90.2	767.0	-1.7	-0.0	5.8	-0.00	2.80	-0.00	-38.1	-0.2	11.2	0.0	-7.5	-0.1

Table 12. Nomenclature for Verification Phase Trajectory Tabulated Summary Data

PAGE HEADING (ALL SUMMARIES)

COMPANY HEADING

DATE	Calendar time at which data were printed
PROJECT	Alpha-numeric notation for referencing a specific test project

LINE 1

RUN	Sequential indexing number for referencing data. A constant throughout each trajectory
TRAJ	Configuration indexing number used to correlate data with the test log
M	Wind tunnel free-stream Mach number
PT	Wind tunnel free-stream total pressure, psfa
TT	Wind tunnel free-stream total temperature, °F
Q	Wind tunnel free-stream dynamic pressure, psf
P	Wind tunnel free-stream static pressure, psfa
T	Wind tunnel free-stream static temperature, °R
RE	Wind tunnel free-stream unit Reynolds number, millions per foot
TDP	Hygrometer dewpoint temperature, °F
SH	Wind tunnel specific humidity, lbm H_2O per lbm air
SCALE	Aircraft model scale factor
H	Simulated pressure altitude, K ft
DT	Initial trajectory integration time increment, sec
DATE	Calendar time at which data were recorded
TIME	Time at which data were recorded (hr/min/sec)
CON SET	Run/point number of constants set used in data reduction

Table 12. Continued

ZERO SET	Run/point number of the air off set of instrument readings used in data reduction
TEST	Alpha-numeric notation for referencing a specific test program in a specific test unit
<u>LINE 2</u>	
STORE	Store model designation
WT	Store full-scale weight, lb
A	Store reference area, ft^2, full scale
L1,L2,L3	Store reference lengths for pitching-moment, yawing-moment, and rolling-moment coefficients, respectively, ft, full scale
XCG	Axial distance from the store nose to the center of gravity location, ft, full scale
DXMCG, DXNCG	Axial distances from the store center of gravity to the pitching-moment and yawing-moment reference centers, respectively, positive in the positive X direction, ft, full scale
YCG,ZCG	Lateral and vertical distances from the store reference (balance) axis to the center of gravity location, positive in the positive Y and Z directions, respectively, ft, full scale
IXX,IYY,IZZ	Full-scale moments of inertia about the store X, Y, and Z axes, respectively, slug-ft^2
IXY,IXZ,IYZ	Full-scale products of inertia in the store X-Y, X-Z, and Y-Z planes, respectively, slug-ft^2
CLP,CMQ,CNR	Store roll-damping, pitch-damping, and yaw-damping derivatives, respectively, per radian
<u>LINE 3</u>	
A/C	Aircraft designation
ALPHA,BETA	Aircraft-model angle of attack and sideslip angle, respectively, deg
NZ	Aircraft load factor, g's

Table 12. Continued

DIVE	Simulated aircraft dive angle, positive for decreasing altitude, deg
BANK	Simulated aircraft bank angle, positive for right wing down, deg
IP,IY	Pitch and yaw incidence angles of the store longitudinal axis at carriage with respect to the aircraft longitudinal axis, positive nose up and nose to the right, respectively, as seen by the pilot, deg
IR	Roll incidence of the store Z axis at carriage with respect to the aircraft plane of symmetry, positive for clockwise roll looking upstream, deg
CONFIG	Aircraft store loading designation
WING	Location of store launch position
MOTN	Restricted motion control parameter 0 = Unrestricted motion 1 = Pivot motion, pitch only 2 = Pivot motion, pitch and yaw 3 = Pivot motion, pitch, yaw, and roll 4 = Rail motion, translate only 5 = Rail motion, translate and pitch 6 = Rail motion, translate and yaw 7 = Rail motion, translate, pitch, and yaw 8 = Pitch, translate in ejector plane only
NROLL	CTS rig roll control parameter 0 = Rolling capability 1 = No roll capability 2 = Zero- or 6-in.-offset roll mechanisms but no roll capability 3 = No roll capability (and assume CLL = 0)
AUTO	Autopilot control flag, 0 = Autopilot off, 1 = Autopilot on
POST	Launch/postlaunch control parameter 0 = Launch trajectory 1 = Postlaunch trajectory

Table 12. Continued

COEF	External coefficient input control parameter 0 = No external coefficient input 1 = Constant external coefficient inputs 2 = Constant external coefficietns inputs and drogue chute axial-force simulation Other = Test peculiar
THRUST	Thrust simulation control parameter 0 = No thrust 1 = Thrust initiation at time zero 2 = Time delay for thrust initiation 3 = Lanyard and time delay for thrust initiation Other = Test peculiar thrust equations
EJECT	Ejector simulation control parameter 0 = No ejectors 1 = Time function ejector forces and cutoff control 2 = Distance function ejector forces and cutoff control 3 = Time function ejector forces and distance function cutoff Other = Test peculiar ejector functions
XFE	Axial distance from the store nose to the forward ejector piston, ft, full scale
DXAE	Distance between forward and aft ejector pistons, ft, full scale
OMGM	Ejector piston line of action with respect to store X-Z plane, positive for clockwise rotation when looking upstream, deg
ZE1,ZE2	Time (distance) cutoffs for forward and aft ejectors, respectively, sec (EJECT = 1) or ft, full scale (EJECT = 2 or 3)

Table 12. Continued

COLUMNAR HEADINGS

SUMMARY 1

PN	Sequential indexing number for referencing data obtained during one run. Indexes each time a new set of data inputs is obtained
T	Cumulative time for the trajectory, seconds of full- scale flight time following release of store
X	Separation distance of the store cg from the flight- axis system origin in that X_F direction, ft, full scale
Y	Separation distance of the store cg from the flight- axis system origin in the Y_F direction, ft, full scale
Z	Separation distance of the store cg from the flight- axis system origin in the Z_F direction, ft, full scale
PSI	Angle beteen the projection of the store longitudinal axis in the X_F-Y_F plane and the X_F axis, positive when the store nose is to the right as seen by the pilot, deg
THA	Angle between the store longitudinal axis and its projection in the X_F-Y_F plane, positive when the store nose is raised as seen by the pilot, deg
PHI	Angle between the store lateral (Y_B) axis and the intersection of the Y_B-Z_B and X_F-Y_F planes, positive for clockwise rotation when looking upstream, deg
ALPHAS,BETAS	Store model angle of attack and sideslip angle, respectively, deg
CAT,CN,CY	Store measured aerodynamic axial-force, normal-force, and side-force coefficients, positive in the negative X, negative Z, and positive Y direction, respectively
CLL,CLM,CLN	Store measured aerodynamic rolling-moment, pitching-moment, and yawing-moment coefficients. The positive vectors are coincident with the positive X, Y, and Z axes, respectively
QA	Simulated full-scale dynamic pressure, psf

Table 12. Continued

FE1,FE2	Forward and aft ejector forces, respectively, lb

SUMMARY 2

PN	Sequential indexing number for referencing data obtained during one run. Indexes each time a new set of data inputs are obtained
T	Cumulative time for the trajectory, seconds of full- scale flight time following release of store
VX,VY,VZ	Velocity components of the full-scale store relative to the origin of a space-fixed axis system in the positive X, Y, and Z directions, respectively, ft/sec
UR	Total velocity of the full-scale store with respect to a space-fixed point, ft/sec
U,V,W	Velocities of the full-scale store relative to the origin of the inertial axis system in the positive X, Y, and Z directions, respectively, ft/sec
P,Q,R	Angular velocities of the full-scale store about the X, Y, and Z axes. The positive vectors are coincident with the positive X, Y, and Z axes, respectively, rad/sec
UDOT,VDOT, WDOT	Accelerations of the full-scale store relative to the origin of the inertial axis system in the positive X, Y, and Z directions, respectively, ft/sec^2
PDOT,QDOT, RDOT	Angular accelerations of the full-scale store about the X, Y, and Z axes. The positive vectors are coincident with the positive X, Y, and Z axes, respectively, rad/sec^2

FLIGHT-AXIS SYSTEM DEFINITIONS

Coordinate Directions

X	Parallel to the current aircraft flight path direction, positive forward as seen by the pilot
Y	Perpendicular to the X and Z directions, positive to the right as seen by the pilot
Z	Parallel to the aircraft plane of symmetry and perpendicular to the current aircraft flight path direction, positive downward as seen by the pilot

Table 12. Concluded

Origin

The flight-axis system origin is coincident with the store cg at release. The origin is fixed with respect to the aircraft and thus translates along the current aircraft flight path at the free-stream velocity. The coordinate axes rotate to maintain alignment of the X axis with the current aircraft-flight path direction.

STORE BODY AXIS SYSTEM DEFINITIONS

Coordinate Directions

X	Parallel to the store longitudinal axis, positive direction is usptream at store release
Y	Perpendicular to X and Z directions, positive to the right looking upstream when the store is at zero yaw and roll angles
Z	Perpendicular to the X direction and parallel to the aircraft plane of symmetry when the store and aircraft are at zero yaw and roll angles, positive downward as seen by the pilot when the store is at zero pitch and roll angles

Origin

The store body-axis system origin is coincident with the store cg at all times. The X, Y, and Z coordinate axes rotate with the store in pitch, yaw, and roll so that mass moments of inertia about the three axes are not time varying quantities.

DATE 24-JUL-85 PROJECT [illegible]
ARVIN/CALSPAN FIELD SERVICES, INC.
AEDC DIVISION
PROPULSION WIND TUNNEL
ARNOLD AIR FORCE STATION, TENNESSEE

Table 13. Verfication Phase Grid Tabulated Summary Data

RUN	SURVEY	M	PT	TT	Q	P	T	V	RE	TOP	SM	SCALE	DATE	TIME	CON SET	ZERO SET	TRANSONIC 16T
953	244	0.599	1195.3	109.1	400.3	707.4	489.6	975.2	2.3	16.2	0.0332	1.000	7/24/85	0:54:39	953/ 4	952/ 1	TEST TF-694

A/C	ALPHA	BETA	IP	IY	IR	CONFIG	WING	STORE	A	L1	L2	L3	XCG	YCG	ZCG	PHIS
F/S	0.00	0.00	0.00	0.00	0.0	2	FUSC	MVB	0.037	0.333	0.333	0.333	0.76	0.00	0.00	0.0

REFERENCE AXIS

BODY AXIS COEFFICIENTS

SUMMARY 1

PN	XREF	YREF	ZREF	DPSI	DTHA	DPHI	ALPHAS	BETAS	CN	CLM	CY	CLN	CLL	CAT	Q	NDX	RUN	PHIREF
8	0.0	0.00	-0.00	0.03	-7.99	-0.02	-7.99	-0.03	-0.684	0.506	0.004	-0.003	0.000	0.762	400.3	1.	953	0.
9	0.0	0.00	0.00	0.03	-3.94	-0.01	-3.94	-0.03	-0.311	0.222	-0.003	0.008	-0.001	0.735	399.9	2.	953	0.
10	0.0	0.00	-0.00	0.03	-1.94	-0.01	-1.94	-0.03	-0.150	0.105	0.007	-0.005	-0.001	0.722	401.5	3.	953	0.
11	0.0	0.00	-0.00	0.02	-0.97	-0.01	-0.97	-0.02	-0.075	0.040	0.002	-0.008	-0.001	0.719	402.6	4.	953	0.
12	0.0	0.01	-0.00	0.03	0.02	-0.01	0.02	-0.06	-0.003	-0.038	0.101	-0.011	-0.000	0.719	402.6	5.	953	0.
13	0.0	0.01	-0.00	0.03	1.03	-0.01	1.03	-0.03	0.080	-0.069	0.092	-0.002	0.000	0.720	403.1	6.	953	0.
14	0.0	0.01	-0.00	0.03	2.02	-0.00	2.02	-0.03	0.158	-0.136	0.100	-0.010	0.000	0.722	402.7	7.	953	0.
15	0.0	0.00	-0.00	0.03	4.05	-0.00	4.05	-0.03	0.315	-0.256	0.101	-0.013	-0.001	0.732	403.1	8.	953	0.
16	0.0	0.00	0.00	0.02	8.06	-0.00	8.06	-0.02	0.685	-0.540	0.101	-0.012	-0.001	0.757	401.6	9.	953	0.
18	0.0	0.00	-0.00	-0.00	-7.98	-179.93	7.98	0.01	0.711	-0.554	0.094	-0.006	-0.001	0.767	400.3	10.	953	0.
19	0.0	0.00	-0.01	0.00	-3.87	-179.94	3.87	0.01	0.335	-0.263	0.036	-0.008	-0.000	0.737	400.1	11.	953	0.
20	0.0	0.00	0.00	0.00	-2.01	-179.95	2.01	0.00	0.165	-0.160	0.102	-0.017	-0.001	0.727	401.9	12.	953	0.
21	0.0	0.00	-0.00	0.00	-0.96	-179.95	0.96	0.00	0.105	-0.092	0.093	-0.006	-0.000	0.724	401.7	13.	953	0.
22	0.0	0.00	-0.01	0.00	0.03	-179.95	-0.03	0.00	0.015	-0.015	0.094	-0.006	-0.000	0.722	401.6	14.	953	0.
23	0.0	0.00	-0.00	0.00	1.01	-179.94	-1.01	0.00	-0.053	0.030	0.093	-0.005	-0.000	0.719	401.1	15.	953	0.
24	0.0	0.00	-0.00	0.01	2.02	-179.94	-2.02	0.00	-0.131	0.090	0.093	-0.007	-0.001	0.720	401.6	16.	953	0.
25	0.0	0.00	-0.00	0.01	4.04	-179.94	-4.04	0.00	-0.292	0.204	0.066	0.001	-0.001	0.734	401.4	17.	953	0.
26	0.0	-0.00	-0.00	0.00	8.12	-179.95	-8.12	-0.01	-0.663	0.493	0.039	-0.012	-0.001	0.758	401.3	18.	953	0.

Table 14. Nomenclature for Verification Phase Grid Tabulated Summary Data

PAGE HEADING (ALL SUMMARIES)

<u>COMPANY HEADING</u>

DATE	Calendar time at which data were printed
PROJECT	Alpha-numeric notation for referencing a specific test project

<u>LINE 1</u>

RUN	Sequential indexing number for referencing data. A constant throughout each trajectory
SURVEY	Configuration indexing number used to correlate data with the test log. Survey may be used to identify all or portions of a grid set.
M	Wind tunnel free-stream Mach number
PT	Wind tunnel free-stream total pressure, psfa
TT	Wind tunnel free-stream total temperature, °F
Q	Wind tunnel free-stream dynamic pressure, psf
P	Wind tunnel free-stream static pressure, psfa
T	Wind tunnel free-stream static temperature, °R
V	Wind tunnel free-stream velocity, ft/sec
RE	Wind tunnel free-stream unit Reynolds number, millions per foot
TDP	Hygrometer dewpoint temperature, °F
SH	Wind tunnel specific humidity, lbm H_2O per lbm air
SCALE	Aircraft model scale factor
DATE	Calendar time at which data were recorded
TIME	Time at which data were recorded (hr/min/sec)
CON SET	Run/point number of constants set used in data reduction

Table 14. Continued

ZERO SET	Run/point number of the air off set of instrument readings used in data reduction
TEST	Alpha-numeric notation for referencing a specific test program in a specific test unit
<u>LINE 2</u>	
A/C	Aircraft designation
ALPHA,BETA	Aircraft-model angle of attack and sideslip angle, respectively, deg
IP,IY	Pitch and yaw incidence angles of the store longitudinal axis at carriage with respect to the aircraft longitudinal axis, positive noe up and nose to the right, respectively, as seen by pilot, deg
IR	Roll incidence of the store Z-axis at carriage with respect to the aircraft plane of symmetry, positive for clockwise roll looking upstream, deg
CONFIG	Aircraft store loading designation
WING	Location of store launch position
STORE	Store model designation
A	Store reference area, ft^2, full scale
L1,L2,L3	Store reference lengths for pitching-moment, yawing-moment, and rolling-moment coefficients, respectively, ft, full scale
XCG	Axial distance from the store nose to the center of gravity location, ft, full scale
YCG,ZCG	Lateral and vertical distances from the store reference (balance) axis to the center of gravity location, positive in the positive Y and Z directions, respectively, ft, full scale
PHIS	Roll angle of the store Number 1 fin with respect to the Z-axis, positive clockwise looking upstream, deg

Table 14. Continued

COLUMNAR HEADINGS

SUMMARY 1

PN	Sequential indexing number for referencing data obtained during one run. Indexes each time a new set of data inputs is obtained
XREF	Position of the store cg with respect to the reference-axis system origin of the X_{REF} direction, ft, full scale
YREF	Position of the store cg with respect to the reference-axis system origin in the Y_{REF} direction, ft, full scale
ZREF	Position of the store cg with respect to the reference-axis system origin in the Z_{REF} direction, ft, full scale
DPSI	Angle between the projection of the store longitudinal axis in the X_p-Y_p plane and the X_p-axis, positive for store nose to the right as seen by the pilot, deg
DTHA	Angle between the store longitudinal axis and its projection in the X_p-Y_p plane, positive when the store nose is raised as seen by the pilot, deg
DPHI	Angle between the store lateral (Y) axis and the intersection of the Y-Z and X-Y planes, positive for clockwise rotation when looking upstream, deg
ALPHAS,BETAS	Store model angle of attack and sideslip angle, respectively, deg
CAT,CN,CY	Store measured aerodynamic axial-force, normal-force, and side-force coefficients, positive in the negative X, negative Z, and positive Y direction, respectively
CLL,CLM,CLN	Store measured aerodynamic rolling-moment, pitching-moment, and yawing-moment coeffients. The positive vectors are coincident with the positive X, Y, and Z axes, respectively
Q	Wind tunnel free-stream dynamic pressure, psf
NDX	Sequential indexing number for referencing data obtained during a grid set. Indexes for each position in the set

Table 14. Continued

RUN	Sequential indexing number for referencing data. A constant throughout sapecified (for all) points of a survey
PHIREF	Angle to which Y_{REF} and Z_{REF} axes are rotated for a grid traverse, positive clockwise from vertical looking upstream, deg

REFERENCE-AXIS SYSTEM DEFINITIONS

Coordinate Directions

X_{REF}	Parallel to the X direction, positive forward as seen by the pilot
Y_{REF}	Perpendicular to the X_{REF} direction and rotated through an angle PHIREF with respect to the Y direction, positive to the right as seen by the pilot for zero rotation angle
Z_{REF}	Perpendicular to the X_{REF} and Y_{REF} directions, positive downward as seen by the pilot for zero rotation of the Y_{REF} axis

Origin

The reference-axis system origin may be arbitrarily chosen and is determined from the set of initial position coordinates input at the initialization of the grid set. It is fixed with respect to the aircraft for the duration of the grid set. For this test, the origin was selected as the store cg location when in the carriage position, PHIREF was zero.

BODY-AXIS SYSTEM DEFINITIONS

Coordinate Directions

X	Parallel to the store longitudinal axis, positive direction is upstream at store release
Y	Perpendicular to X and Z directions, positive to the right looking upstream when the store is at zero yaw and roll angles
Z	Perpendicular to the X direction and parallel to the aircraft plane of symmetry when the store and aircraft are at zero yaw and roll angles, positive downward as seen by the pilot when the store is at zero pitch and roll angles

Table 14. Concluded

Origin

The store body-axis system origin is coincident with the store cg at all time. The X, Y, and Z coordinate axes rotate with the store in pitch, yaw, and roll so that mass moments of inertia about the three axes are not time-varying quantities.

DATE 24-JUL-85 PROJECT NO P41G-06
ARVIN/CALSPAN FIELD SERVICES, INC.
AEDC DIVISION
PROPULSION WIND TUNNEL
ARNOLD AIR FORCE STATION, TENNESSEE

Table 15. Calibration Phase Tabulated Summary Data

a. Solid Floor Pressures

RUN	PN	PROJECT	TEST	DATE	DAY HR MIN SEC	MODE	DELPI	PROD DATE	WINDOFF	SET	CART	TRANSONIC 16T
1006	2	P41G-06	TF-634	7/24/85	205: 8:26:30	0/ 0	1360	24-JUL-85	1004/ 1	18	2.	

M	PT	P	Q	REX10-6	TT	TTR	H	PC	DP	WA	TPR	SMX10+3	TOP	DTOPS	PATM
.000	2043.3	2042.6	1.0	0.121	97.3	557.0	974.	2042.6	0.7	0.51	1.000	124.929	132.3	-32.6	2043.0

K15	DDAS:A	SAMPRA	DPS:PSSCI	PSSLOP	PSTOUT	PSTREQ	PSCHMS	PSVMS	PSPCHS	PSNCNS	PSNPBC	PSNPOR	A	SAMPRA	SVET	SVPS
***	0.000	0.	1.0	3.0	15.0	1.5	0.0	0.0	100.0	0.0	0.0	0.0	0.8	30.0	0.0	0.0

SVPD	SVSLOP	SVTOUT	SVNVLV	SVNPRT	SVHPRV	SVIAC	ASV	SAMRSV
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	120.0

** SOLID FLOOR PRESSURES **

STA	-8	-7.5	-7	-6.5	-6	-5.5	-5	-4.5	-4	-3.5	-3	-2.5	-2	-1.5
P	2042.7	2042.7	2042.6	2042.7	2042.7	2042.7	2042.6	2042.7	2042.6	9999.9	2042.7	9999.9	2042.7	9999.9
CP	0.0441	-0.0100	-0.0639	-0.0100	0.0440	-0.0100	-0.0640	-0.0100	-0.0641	0.0000	-0.0100	0.0000	-0.0100	0.0000
M	0.0204	0.0210	0.0215	0.0210	0.0204	0.0210	0.0215	0.0210	0.0215	0.0000	0.0210	0.0000	0.0210	0.0000

STA	-1	-0.5	0	0.25	0.5	0.75	1	1.25	1.5	1.75	2	2.25	2.5	2.75
P	2042.7	2042.7	2042.6	2042.7	9999.9	9999.9	9999.9	9999.9	2042.6	2042.7	2042.7	2042.7	2042.6	2042.7
CP	0.0439	-0.0100	-0.1719	-0.0100	0.0000	0.0000	0.0000	0.0000	-0.0640	-0.0100	-0.0100	0.0440	-0.0639	-0.0100
M	0.0204	0.0210	0.0226	0.0210	0.0000	0.0000	0.0000	0.0000	0.0215	0.0210	0.0210	0.0204	0.0215	0.0210

STA	3	3.25	3.5	3.75	4	4.25	4.5	4.75	5	5.25	5.5	5.75	6	6.25
P	2042.7	2042.7	2042.7	2042.6	2042.7	2042.7	2042.7	2042.7	2042.6	2042.7	2042.7	2042.7	2042.7	2042.7
CP	-0.0100	-0.0100	0.0444	-0.0639	-0.0100	-0.0100	0.0442	-0.0100	-0.0641	-0.0100	0.0440	-0.0100	0.0441	0.0441
M	0.0210	0.0210	0.0204	0.0215	0.0210	0.0210	0.0204	0.0210	0.0215	0.0210	0.0204	0.0210	0.0204	0.0204

STA	6.5	6.75	7	7.25	7.5	7.75	8	8.25	8.5	8.75	9	9.25	9.5	9.75
P	2042.7	2042.7	2042.7	2042.7	2042.7	2042.6	2042.6	2042.7	2042.7	2042.7	2042.7	2042.7	2042.7	2042.7
CP	0.0441	0.0440	0.0380	-0.0100	0.0435	-0.1120	-0.0641	-0.0100	0.0439	-0.0100	0.0439	-0.0100	-0.0100	0.0441
M	0.0204	0.0204	0.0198	0.0210	0.0204	0.0221	0.0215	0.0210	0.0204	0.0210	0.0204	0.0210	0.0210	0.0204

STA	10	10.5	11	11.5	12	12.5	13	13.5	14	14.5	15	15.5	16	16.5
P	2042.7	2042.6	2042.7	2042.7	2042.7	2042.6	2042.6	2042.6	2042.7	2042.7	2042.7	2042.7	2042.6	2042.6
CP	-0.0100	-0.0640	0.0442	-0.0100	0.0442	-0.0640	-0.0641	-0.0639	-0.0100	-0.0100	-0.0100	-0.0100	-0.0636	-0.0641
M	0.0210	0.0215	0.0204	0.0210	0.0204	0.0215	0.0215	0.0215	0.0210	0.0210	0.0210	0.0210	0.0215	0.0215

STA	17	17.5	18	18.5	19	19.5	20	20.5	21	21.5	22	23	24	25	26
P	2042.7	2042.6	2042.6	2042.6	2042.6	2042.7	2042.7	2042.7	2042.7	2042.6	2042.7	2042.7	2042.6	2042.7	2042.7
CP	0.0441	-0.0641	-0.0639	-0.1709	-0.0639	-0.0100	-0.0100	0.0441	-0.0100	-0.0639	0.0441	-0.0100	-0.0638	0.0439	0.0439
M	0.0204	0.0215	0.0215	0.0226	0.0215	0.0210	0.0210	0.0204	0.0210	0.0215	0.0204	0.0210	0.0215	0.0204	0.0204

DATE 24-JUL-85 PROJECT NO P41G-35
ARVIN/CALSPAN FIELD SERVICES, INC.
AEDC DIVISION
PROPULSION WIND TUNNEL
ARNOLD AIR FORCE STATION, TENNESSEE

Table 15. Concluded

b. Porous Floor and Ceiling Pressures

RUN	PN	PROJECT	TEST	DATE	DAY HR MIN SEC	MODE	DELPI	PROD DATE	WINDOFF	SET	CART	TRANSONIC 16T
1004	2	P41G-06	TF-694	7/24/85	205: 8:26:30	0/ 0	1360	24-JUL-85	1004/ 1	18	2.	

M	PT	P	Q	REX10-6	TT	TTR	H	PC	DP	WA	TPR	SHX10+3	TDP	DTDPS	PATM
.000	2043.3	2042.6	1.0	0.121	97.3	557.0	974.	2042.6	0.7	0.51	1.000	124.929	132.3	-32.6	2043.0

K15	DDAS:A	SAMPRA	DPS:PSSCI	PSSLOP	PSTOUT	PSTREG	PSCHMS	PSVMS	PSPCHS	PSNCNS	PSNP3C	PSNPDR	A	SAMPRA	SVET	SVPS
***	0.000	0.	1.0	3.0	15.0	1.5	0.0	0.0	100.0	0.0	0.0	0.0	0.8	30.0	0.0	0.0

SVPD	SVSLOP	SVTOUT	SVNVLV	SVNPRT	SVNPRV	SVIAC_ASV	SAMRSV
0.0	0.0	0.0	0.0	0.0	0.0	0.0 0.0	120.0

** POROUS FLOOR PRESSURES **

STA	1	2	3	4	5	6	7	8	9	10	11	12	13	14
P	2042.7	2042.7	2042.7	2042.6	2042.7	2042.7	2042.7	2042.6	2042.6	2042.6	2042.7	2042.7	2042.7	2042.7
CP	0.0439	0.0440	-0.0100	-0.0643	0.0439	0.0980	-0.0100	-0.0640	-0.0639	-0.0638	-0.0100	0.0441	-0.0100	-0.0100
M	0.0204	0.0204	0.0210	0.0215	0.0204	0.0198	0.0210	0.0215	0.0215	0.0215	0.0210	0.0204	0.0210	0.0210

STA	15	16	17	18	19	20
P	2042.7	2042.7	2042.7	2042.6	2042.7	2042.7
CP	-0.0100	-0.0100	0.0976	-0.0641	0.0978	-0.0100
M	0.0210	0.0210	0.0198	0.0215	0.0198	0.0210

** POROUS CEILING PRESSURES **

STA	1	2	3	4	5	6	7	8	9	10	11	12	13	14
P	2042.7	2042.7	2042.7	2042.6	2042.6	2042.6	2042.7	2042.6	2042.9	2042.7	2042.7	2042.7	2042.7	2042.7
CP	0.0438	-0.0100	-0.0100	-0.0641	-0.0638	-0.1181	0.0441	-0.0639	0.3144	0.0438	0.0440	0.0443	0.0438	-0.0100
M	0.0204	0.0210	0.0210	0.0215	0.0215	0.0221	0.0204	0.0215	0.0173	0.0204	0.0204	0.0204	0.0204	0.0210

STA	15	16	17	18	19	20
P	2042.7	2042.8	2042.7	2042.7	2042.7	2042.6
CP	-0.0100	0.1516	-0.0100	0.0983	0.0443	-0.0450
M	0.0210	0.0192	0.0210	0.0199	0.0204	0.0213

XI	YI	ZI
11.6	0.0	0.0

* * * * * * * * * * AVERAGING REGION DATA * * * * * * * * * *

STATIONS	P	M	Q	2SIG	DM	REGION
(1.00 TO 11.60)	2042.7	0.0209	0.6	0.0095	-0.0013	L1
(6.00 TO 18.00)	2042.7	0.0209	0.6	0.0010	-0.0012	L2
(1.00 TO 11.60)	2042.7	0.0209	0.6	0.0012	-0.0012	EP
(1.00 TO 11.60)	2042.7	0.0207	0.6	0.0025	-0.0014	TP

Table 16. Nomenclature for the Calibration Phase Tabulated Summary Data

PAGE 1

Page Heading (All Summaries)

COMPANY HEADING

DATE	Calendar time at which data were printed
PROJECT	Alpha-numeric notation for referencing a specific test project

LINE 1

RUN	Run number
PN	Point number
PROJECT	Calspan Corporation project number
TEST	Calspan Corporation test number
DATE	Date the data were taken
DAY	Number of days into the year that the data were taken
HR	Hour in the day that the data were taken
MIN	Minutes into the hour that the data were taken
SEC	Seconds into the minute that the data were taken
MODE	Data acquisition selection mode
DELPI	Primary tunnel conditions input and selection codes
PROD DATE	Date the data were computed
WINDOFF	Wind off RUN/PN used to reduce the data
SET	Constant saet that was used to reduce the data
CART	Test cart number

LINE 2

M	Free-stream Mach number (basded on previous calibration data)

Table 16. Continued

PT	Free-stream total pressure, psfa
P	Free-stream static pressure, psfa (based on previous calibration data)
Q	Free-stream dynamic pressure, psf (based on previous calibration data)
REx10-6	Free-stream Reynolds number, per ft (based on previous calibration data)
TT	Free-stream total temeprature, °F
TTR	Free-stream total temperature, °R
H	Pressure altitude, ft
PC	Tunnel plenum chamber pressure, psfa
DP	Differential pressure (PT-PC), psf
WA	Test section wall angle, degrees (positive for wall divergence)
TPR	Tunnel pressure ratio
SHx10 + 3	Tunnel specific humidity
TDP	Tunnel dewpoint temperature, °F
DTDPS	Test section static and dewpoint temperature difference, TT-TDP, °F
PATM	Atmospheric pressure, psfa

SOLID FLOOR PRESSURES

STA	Static orifice nominal tunnel station, ft (see Fig. 7a and Table 3a for orifice locations)
P	Local static pressure, psfa
CP	Local static pressure coefficient
M	Local Mach number

Table 16. Concluded

PAGE 2

POROUS FLOOR/CEILING PRESSURES

STA	Static orifice nominal tunnel station, ft (see Fig. 7b and Table 3b for orifice locations)
P	Local static pressure, psfa
CP	Local static pressure coefficient
M	Local Mach number
XI	The downstream boundary (tunnel station) of the interference-free test region which is located 54 in. upstream of the Angular Drive Mechanism, ft
YI	Horizontal position of the CTS strut, positive left when looking upstream, ft
ZI	Vertical position of the CTS boom, positive up when looking upstream, ft

AVERAGING REGION DATA

STATIONS	The range of tunnel stations for which the averages are calculated
P	Average static pressure, psfa
M	Average Mach number
Q	Average dynamic pressure, psf
2SIG	Two times the standard deviation of the Mach numbers in the averaging region
DM	Calibration parameter, M - Mc, where Mc is the equivalent plenum Mach number
REGION	Average region designation
where:	L1,L2 are based on the solid plate pressure BP,TP are based on the bottom and top wall perforated plate pressure, respectively

END

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